MAIN REPORT

ACE RIVER BASIN STUDY

SOUTH CAROLINA

WATER AND LAND RESOURCES

U.S. DEPARTMENT OF AGRICULTURE

ECONOMIC RESEARCH SERVICE
FOREST SERVICE
SOIL CONSERVATION SERVICE

1977

500 copies

MAIN REPORT

ACE RIVER BASIN
COOPERATIVE STUDY

WATER AND LAND RESOURCES

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE
SOIL CONSERVATION SERVICE

in cooperation with
THE SOUTH CAROLINA WATER RESOURCES COMMISSION

1977

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SUMMARY

Purpose of Study and Agencies Involved

The study of the water and related land resources in the Ashley-Combahee-Edisto (ACE) Basin is being made under Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended). Agencies of the U.S. Department of Agriculture (USDA) with direct responsibilities in the study are the Soil Conservation Service, Economic Research Service and the Forest Service. The work of these agencies is directed by a Field Advisory Committee composed of one representative from each agency. A Washington Advisory Committee directs the work at the national level.

The South Carolina Water Resources Commission represents the state and coordinates the study.

The overall purpose of the study is to improve the quality of life of the basin's residents through contributions to national economic development and environmental quality objectives. Components of these objectives are listed in Chapter 1.

This report is to be provided to federal, state and local interests for use as a guide to conserving, developing and utilizing their water and related land resources in an efficient and timely manner. It will serve as an aid to decision-makers in choosing among alternatives or competing uses of resources.

Size and Location

The Ashley-Combahee-Edisto (ACE) Basin is a triangular shaped area of 4,475,876 acres in southern South Carolina. The basin boundary can be defined roughly as a line from the Savannah Harbor, northwest to Batesburg, southeast to Charleston and then southwesterly along the coast back to the Savannah Harbor. (See General Basin Map, Figure 2-1.)

Problems and Objectives

The ACE River Basin is predominantly a rural area with little industrial development, but having a wealth of natural resources. The area has problems common to such rural areas. The incomes of residents are on the average less than the rest of the state and nation. Farm incomes are the lowest in the region. Educational levels are below average, as are quality and quantity of medical facilities.

In the ACE Study Area, population is expected to double during the next 50 years, reaching 1.07 million persons by 2020. Employment in the region is expected to increase from the current rate of 32 percent of the population to 37 percent (398,000 persons) by 2020. Per capita income is also expected to rise from the present level of $2,400 to $11,900 by 2020.

Agricultural production in the ACE Basin is expected to increase considerably by 2020 as a result of greater population and increased export demands. Land in agricultural production is expected to increase from the current level of 781,000 acres to 1,009,000 acres by 2020. This indicates a need to protect agricultural land not currently in production, because of its future need. This is particularly true for highly productive prime agricultural land which is often most desirable for urban and industrial uses as well.

Commercial forest acreage in the basin is expected to decline gradually as more and more forest land is converted to agricultural and urban uses. It is estimated that by 2020, commercial forest acreage will have declined to about 2.5 million acres, a 4.8 percent drop from the present acreage.

The goal of the study is to find means to increase the basin's income through contributions to economic development, while at the same time preserving or enhancing the quality of the basin's environmental resources. In order to achieve this goal, three plans have been prepared. The National Economic Development Plan concentrates on increasing the incomes of the basin's residents with little regard for environmental concerns. The Environmental Quality Alternative has as its goal the preservation of natural resources at the expense of economic development. The Preferred Plan combines elements of these two plans so that both economic and environmental values can be considered.

Needs

Components needed to meet objectives of the study have been identified. These components will contribute to either economic development or environmental quality, or both. Generally, these needs are as follows:

Economic Development

...increased agricultural production efficiency

...increased forestry production efficiency

...erosion damage reduction

...floodwater damage reduction and drainage improvement on agricultural and forest land

...nonagricultural floodwater damage reduction

...improved water supply

...improved water distribution systems

...increased recreational opportunities

Environmental Quality

...protection and improvement of visual quality

...improved land and water quality

...preservation and/or enhancement of biological resources

...preservation of archeological and historical sites

Measures planned to satisfy component needs are listed in Summary Table 1.

SUMMARY TABLE 1: DISPLAY OF PREFERRED PLAN EFFECTS AND PROGRAM OPPORTUNITIES

ACE BASIN

	National Economic Development Account		Environmental Quality Account	Regional Development Account		Social Well-Being Account			
	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial and Adverse	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial	Adverse	Program Opportunities - USDA	Coordination by Others for Implementation
Land treatment, cropland 207,000 acres for erosion control			Reduce loss of soil resources, reduce sediment delivered to streams, protect soil resource, improve wildlife habitat			Improve crop production		PL 46 - Districts' program - furnish accelerated technical assistance ACP cost-sharing funds to accelerate installation	Individual property owners pay costs not borne by ACP costs
10,000 acres for irrigation			Reduce acres needed for production			Improve crop production		PL 46 technical assistance for design of system	Individual farmers pay costs
Land treatment, pastureland planting 80,000 acres, improving 160,000 acres			Reduce soil erosion, improve water quality, provide wildlife habitat			Improve forage production		PL 46 technical assistance ACP cost-sharing for planting grass	Individual farmers pay costs not borne by USDA
Land treatment, forest land			Improve natural beauty, enhance wildlife habitat, reduce sediment into streams			Insure production of forest products		Technical assistance from Cooperative Forest Management, General Forestry Assistance, Cooperative Forest Fire Prevention, Forest Insect and Disease Management Cost-sharing from Forestry Incentives Program and ACP	Individual forest owners pay costs not borne by USDA
Major outlet channels and on-farm systems	7,843,000	3,901,000	Require clearing of 4,600 acres for rights-of-way and change natural vegetation Reduce flooding of 373,600 acres Installation could degrade water quality during construction Reduce acres needed for crop production	7,843,000 Create 472 jobs in agricultural sector, 847 man-years of employment for construction and 90 jobs for OM&R	4,201,000	Create employment for area citizens Reduce hazard of flooding		PL-566 - provide cost-sharing for construction and engineering RC&D - provide cost-sharing for construction and engineering ACP - provide cost-sharing for construction of on-farm systems PL 46 - provide technical assistance for on-farm systems	Local organizations must sponsor PL-566 and RC&D measures - They must provide 25 percent of the construction costs and all land rights for projects - Individuals or groups usually provide construction funds for on-farm systems not provided by ACP funds

SUMMARY TABLE 1: DISPLAY OF PREFERRED PLAN EFFECTS AND PROGRAM OPPORTUNITIES (Continued-1)

ACE BASIN

Plan Elements	National Economic Development Account		Environmental Quality Account	Regional Development Account		Social Well-Being Account		Program Opportunities - USDA	Coordination by Others for Implementation
	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial and Adverse	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial	Adverse		
Flood proofing and relocating 450 homes and businesses	94,000	94,000	Reduce flooding to homes and businesses	94,000	94,000	Reduce flood hazard			Local communities or individual landowners usually finance the work
112 miles of nonagricultural outlet channels	365,000	170,000	Reduce flooding to nonagricultural areas Require clearing of 500 acres for rights-of-way	365,000	170,000	Reduce flood hazard Reduce insects		PL-566 and RC&D - provide a portion of the construction costs and engineering services	Local sponsoring organizations must sponsor PL-566 projects and RC&D measures - They must provide 25 percent of the construction costs and all land rights - Local groups will also provide collector systems to convey water to main outlets
Wells and water distribution systems	3,636,000	3,456,000		3,636,000	3,456,000	Provide dependable water supply		Farmers Home Administration (FmHA) loans help finance construction and design costs	Local organizations must be formed and agreements made for repayment of loans and OM&R of systems
Irrigation ponds			About 750 acres will be inundated, fish can be produced in the ponds			Fishing opportunities increased on 750 acres		PL 46 - provide technical assistance for design FmHA loans for construction ACP - provide cost-sharing for construction	Individual farmers pay costs not provided by USDA
Public recreation areas	3,910,000	3,546,000	Natural beauty may be preserved in park areas	3,910,000	3,546,000	Provides 2,172,000 visitor-days of recreational opportunity		RC&D funds - provide cost-sharing in six public areas for land rights, construction and engineering The National Forest - provide some funds or land for recreational development	The Bureau of Outdoor Recreation may furnish funds for recreation - The South Carolina Department of Parks, Recreation and Tourism, county governments or organized local organizations will pay all costs not furnished by federal funds
Treatment of critically eroding areas			Reduce erosion and sediment, enhance natural beauty			Protect natural resources and may improve safety of roads		RC&D funds and ACP funds - cost-share in treatment of areas FmHA loans - help finance treatment	Local property owners, counties and the state highway department may pay other than USDA costs
Selection of solid waste disposal sites			Improve natural beauty, improve water quality			Improve health conditions		PL 46 - provide technical assistance	Local governments usually pay installation costs

SUMMARY TABLE 1: DISPLAY OF PREFERRED PLAN EFFECTS AND PROGRAM OPPORTUNITIES (Continued-2)

ACE BASIN

Plan Elements	National Economic Development Account		Environmental Quality Account	Regional Development Account		Social Well-Being Account		Program Opportunities - USDA	Coordination by Others for Implementation
	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial and Adverse	Beneficial (Annual Dollars) 1/	Adverse (Annual Dollars) 2/	Beneficial	Adverse		
Wastewater treatment system	5,307,000	5,007,000	Reduce pollution in streams, improve wildlife habitat	5,307,000 Provide jobs for construction and OM&R	5,007,000	Improve health conditions Provide employment for construction and OM&R		FmHA loans - provide funds for engineering and construction	Local organizations must provide repayment and OM&R funds
Wild and scenic rivers			Protect scenic beauty and wildlife and fishery resources						The South Carolina Water Resources Commission provides leadership - Local organizations and individuals may provide funds and easements
Forest improvements for wildlife			Improvement in wildlife habitat			Increase hunting opportunities		The various forestry programs - provide technical assistance	Individual landowners usually pay costs on their land
Fish pond construction and management			Improvement in fish habitat			Increase fishing opportunities		PL 46 - provide technical assistance ACP - provide cost-sharing for construction	Individual landowners usually pay costs not provided by USDA
Site selection for protection of threatened and endangered species			Protection of threatened and endangered species						The South Carolina Wildlife and Marine Resources Department, along with environmental organizations, universities and interested individuals can strengthen this effort
Protection of wetlands			Enhance wildlife habitat, help maintain ecological balance					USDA programs - help identify high value hardwood sites and assist landowners plan for protection of these sites	The South Carolina Wildlife and Marine Resources Department should maintain leadership for protecting wetlands - The Coastal Zone Management Plan should outline plans for protecting coastal wetlands
Protection of archeological and historical sites			Maintenance of these links of the basin's history					During project planning, USDA agencies will recognize and protect these resources	The universities and state agencies can continue to study and identify archeological and historical values

1/ Agricultural benefits, current normalized; all other, 1975.
2/ 1975 price base, costs amortized at 6 3/8 percent interest for 50 years.

CHAPTER 1 - INTRODUCTION

The citizens of South Carolina are vitally interested in all of their natural resources. They want a clean environment, along with production of goods and services and meaningful employment. With these broad goals in mind, the Governor of South Carolina made a request to the Secretary of Agriculture for a study of water and related land resources in the Ashley-Combahee-Edisto (ACE) Basin.

The study is being made under Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended).

U.S. Department of Agriculture (USDA) agencies assigned direct responsibilities in the study are the Soil Conservation Service (SCS), Economic Research Service (ERS) and the Forest Service (FS). The SCS has overall responsibility for coordinating the study within USDA. ERS has responsibilities pertaining to economic studies, agricultural projections and impacts of proposed projects. The FS has responsibilities pertaining to the total forest program including production, management, projections and other broader uses such as recreation and fish and wildlife.

The USDA agencies work under the direction of a Field Advisory Committee composed of one representative each from the SCS, ERS and FS. A Washington Advisory Committee directs the study at the national level.

The South Carolina Water Resources Commission was assigned by the Governor to represent the state and coordinate the study. The Commission is responsible for the procurement of information from state, regional and local governments, and also assists in insuring that the public is adequately involved in the proposals made by the study.

The overall purpose of the study is directed toward improvement in the quality of life through contributions to the objectives of national economic development and environmental quality. The national economic development objective is to increase the value of the nation's output of goods and services and improve national economic efficiency. The environmental quality objective is to manage, conserve, preserve, create, restore and/or improve the quality of certain natural and cultural resources and ecological systems.

Components of the national economic development objective are as follows:

1. Increasing value of the nation's output of goods and services required to meet existing and projected demands

    a. increasing agricultural and forest outputs
    b. increasing use of recreational resources
    c. increasing water supply where needed to meet existing and projected needs
    d. increasing productivity of all resources - natural, labor and capital
    e. reducing disruption of economic activity
    f. reducing damages to committed resources
    g. increasing income through the employment of underemployed labor and capital resources
    h. increasing income through cost savings that result in exporting of resources for employment elsewhere

2. Increasing value of output resulting from external economies

    a. improving productive efficiency through use of better technology made feasible because of project outputs
    b. increasing income which is generated to suppliers of goods and services as a result of project outputs which directly or indirectly benefit their customers

Components of the environmental quality objective are as follows:

1. Management, protection, enhancement or creation of areas of natural beauty and human enjoyment such as open and green space(s), streams and river systems, lakes and reservoirs, beaches, shores and wetlands

2. Management, preservation or enhancement of especially valuable or outstanding biological resources and ecosystems

3. Management, preservation or enhancement of especially valuable or unique geological, archeological and historical resources

4. Enhancement of quality aspects of water and land by control of pollution, prevention of erosion and restoration of eroded areas in order to harmonize land use objectives in terms of productivity for economic use and development with conservation of the resources

5. Careful evaluation of irreversible or irretrievable commitments of resources

Broadly, the objectives are to provide a guide for federal, state and local interests to conserve, develop and utilize their water and related land resources in an efficient and timely manner. Further, such planning should provide a sound basis for rational, well-considered decisions among alternatives or competing uses of these resources - the meeting of needs and desires of people which includes the improvement in the quality of the environment, the enhancement of national economic development, the betterment of the quality of life and the stimulation of regional development.

State and federal agencies, regional councils, local governments, and others have given excellent cooperation in providing inventory materials. They have pledged their cooperation throughout the study and their many views will have an even greater impact on the remaining phases of the study.

Work groups with assignments for specific subjects were organized early in the study. Members of the work groups included representatives from federal, state and local governments, universities and other organizations. The following work groups have made contributions to the study: Economics, Water Resources, Land Resources, Forestry Resources, Recreation and Fish and Wildlife.

Several other agencies have completed important studies involving the water and related land resources within the Ashley-Combahee-Edisto Basin. Among these are the following:

"ACE" Framework Study, prepared by the South Carolina Water Resources Commission. This study contains water supply, demand and quality data and identifies the need for water and waste management planning.

Port Royal Sound Environmental Study, prepared by the South Carolina Water Resources Commission. Evaluated in this study are various aspects of the coastal ecosystems, including biological systems, hydrological systems and quality of air and water.

Edisto-Combahee River Basin Water Quality Analysis, prepared by the South Carolina Department of Health and Environmental Control. Contained are evaluations of water quality problems related to specific point and non-point sources of pollution.

Edisto River Basin, Feasibility Report for Water Resources Development, prepared by the U.S. Army Corps of Engineers. This study determined the feasibility of providing flood control and related water resource development in the Edisto River Basin.

Various studies have been completed by the councils of government involved which are pertinent to the problems addressed in the ACE Study. Water supply and treatment facilities, recreation and land use planning are among the subjects they have treated.

The report should be useful as a source of information for resource planners, it should help in recognizing limitations in the use of soil and water resources and it will help identify projects and programs in which USDA agencies will be involved during the next 15-25 years.

The report of the study includes inventories of natural and economic resources, future without development projections, problems and needs, alternative solutions that will help meet needs, a preferred plan and opportunities for USDA programs and other agency programs to carry out the preferred plan.

All information and data, except as otherwise noted by reference to source, were collected during planning investigations by the Soil Conservation Service, Economic Research Service and Forest Service, of the U.S. Department of Agriculture. Contributions by state agencies, county governing bodies, organizations, universities, conservation districts, councils of government and individuals are acknowledged and greatly appreciated.

CHAPTER 2 - NATURAL RESOURCE BASE

Location

The Ashley-Combahee-Edisto (ACE) Basin is a triangular shaped area of 4,475,876 acres in southern South Carolina. The basin boundary can be defined roughly as a line from the Savannah Harbor, northwest to Batesburg, southeast to Charleston and then southwesterly along the coast back to the Savannah Harbor. Four counties (Bamberg, Beaufort, Colleton and Dorchester) are located entirely within the basin. Twelve other counties partially within the basin are Aiken, Allendale, Barnwell, Berkeley, Calhoun, Charleston, Edgefield, Hampton, Jasper, Lexington, Orangeburg and Saluda. The basin is located between latitudes 32°02'30" and 30°52'30" and longitudes 79°52'30" and 81°52'30". (See General Basin Map, Figure 2-1.)

The ACE Basin is bordered by the Santee Basin on the northeast, the Savannah Basin on the southwest, and the Atlantic Ocean on the southeast. Almost half of the area is drained by the Edisto River, 40 percent by the Combahee and other tidal rivers, and the remaining 10 percent by the Ashley River. These rivers represent individual hydrologic units draining into the Atlantic Ocean.

Climate

The Ashley-Combahee-Edisto Basin has an average annual precipitation rate of 48 inches. The annual rainfall has ranged from a high of 75.10 inches in 1964 to a low of 27.66 inches in 1954. Monthly mean precipitation rates vary from 2.12 inches in November to 7.15 inches in July. (See Figure 2-2 for monthly and seasonal distribution.) The highest monthly rainfall on record at Summerville was 19.42 inches which occurred in June 1973. Several summer months have had monthly rainfalls exceeding 15 inches. Figure 2-3 shows maximum, average and minimum monthly rainfall on record for two locations within the basin. The annual rainfall distribution across the basin is shown in Figure 2-4, while Figure 2-5 gives the mean precipitation during the growing season.

Snow is not unusual in the northwestern corner of the basin, but is rare in the southern portion. However, in February 1973, a record snowfall of up to 22 inches covered the basin. Beaufort had four inches and Orangeburg had 22 inches. Drifts of 7 to 8 feet could be found in some locations. Seldom do accumulations of snow remain on the ground for more than a day or two.

Severe weather comes occasionally in the form of violent thunderstorms, tornadoes, and hurricanes. Although thunderstorms are common in the summer months, the violent ones generally accompany the squall lines and active cold fronts during spring. Generally, they bring

Location in South Carolina

FIGURE 2-1: GENERAL BASIN MAP

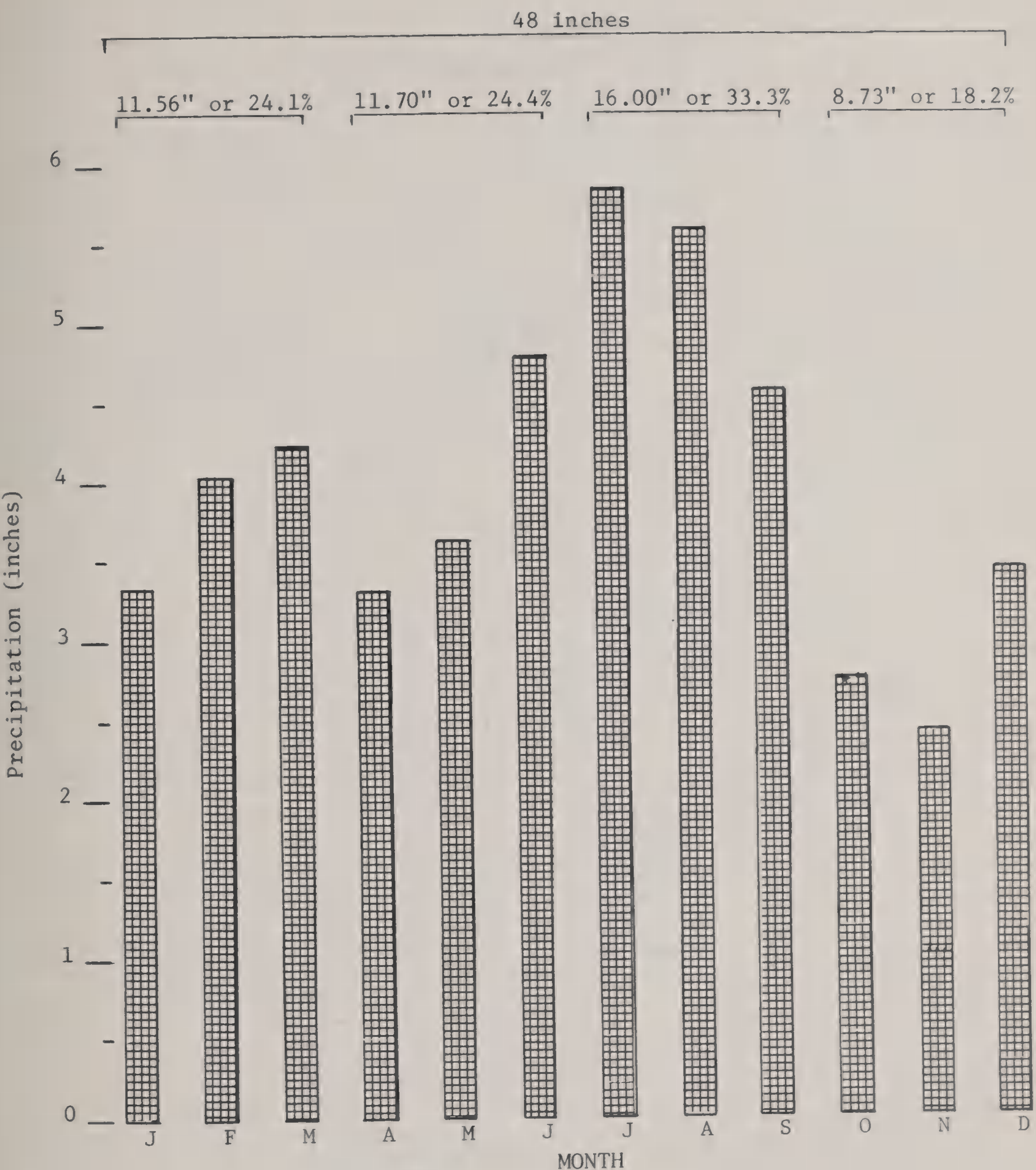
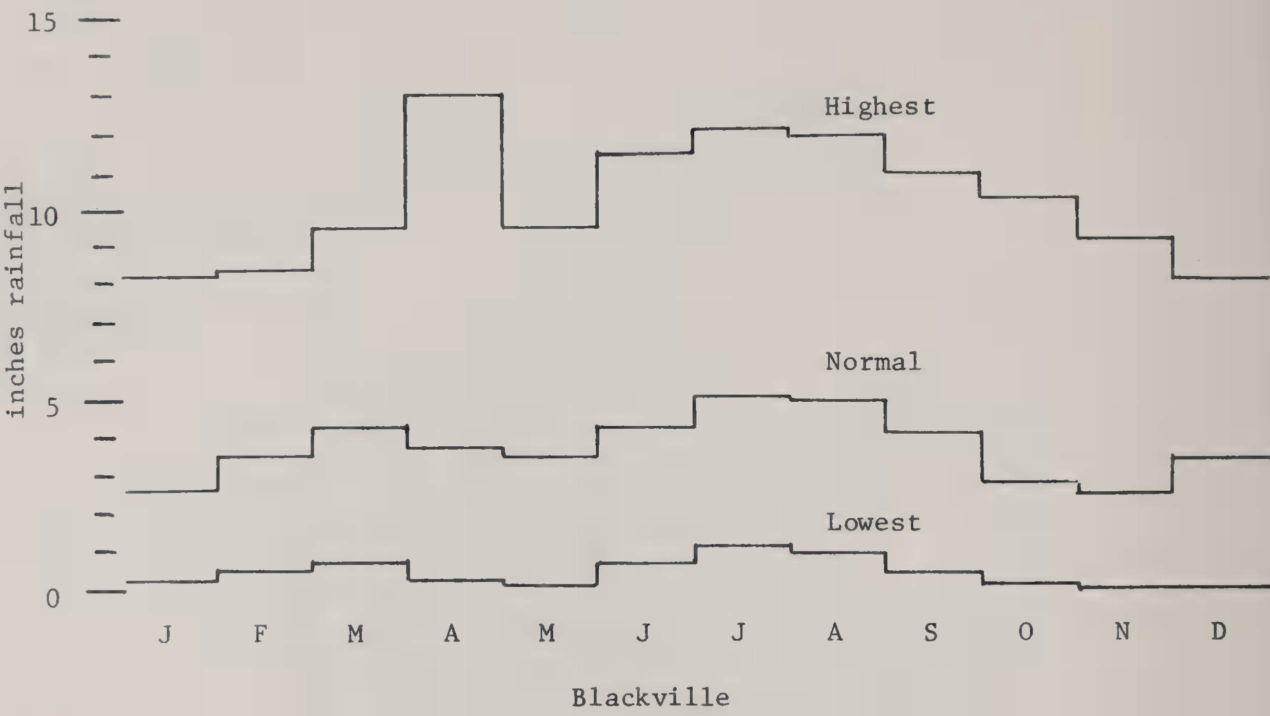


FIGURE 2-2: AVERAGE ANNUAL RAINFALL DISTRIBUTION

ACE BASIN



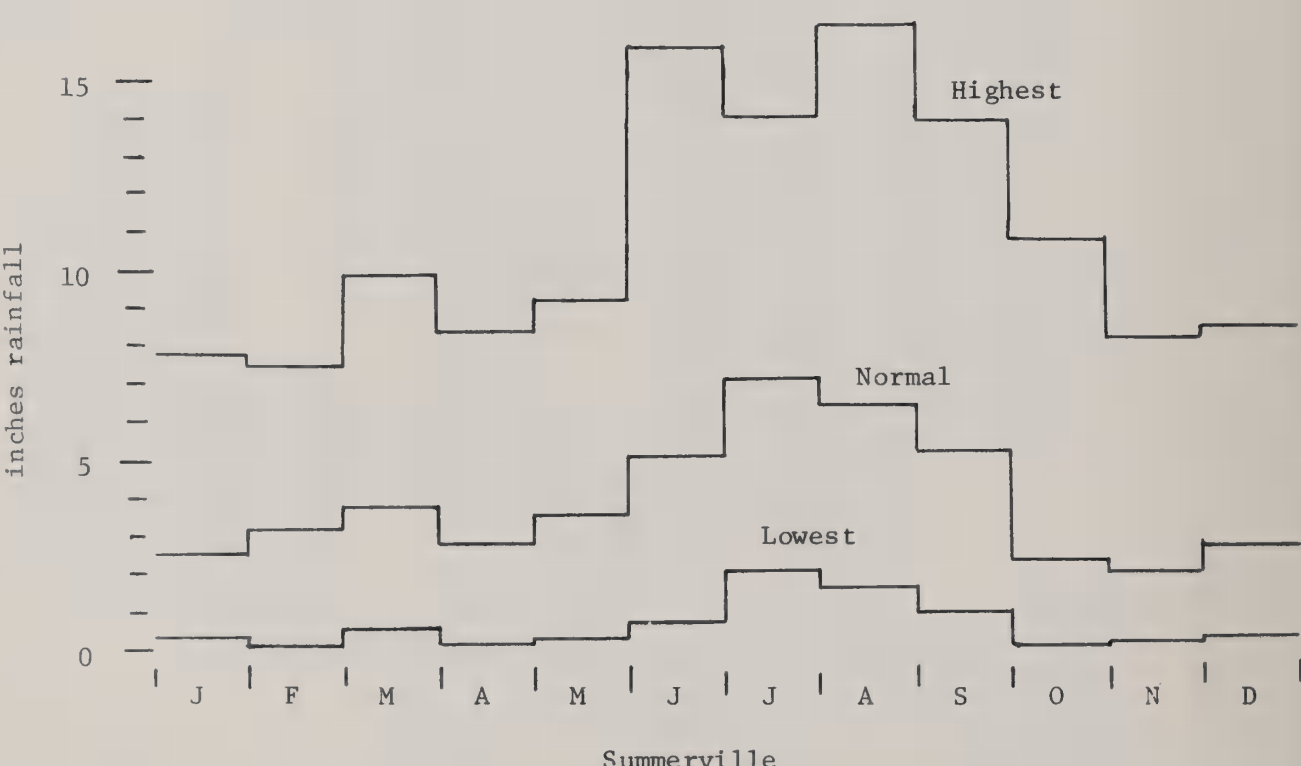


FIGURE 2-3: MONTHLY RAINFALL OF RECORD FOR TWO LOCATIONS

ACE RIVER BASIN

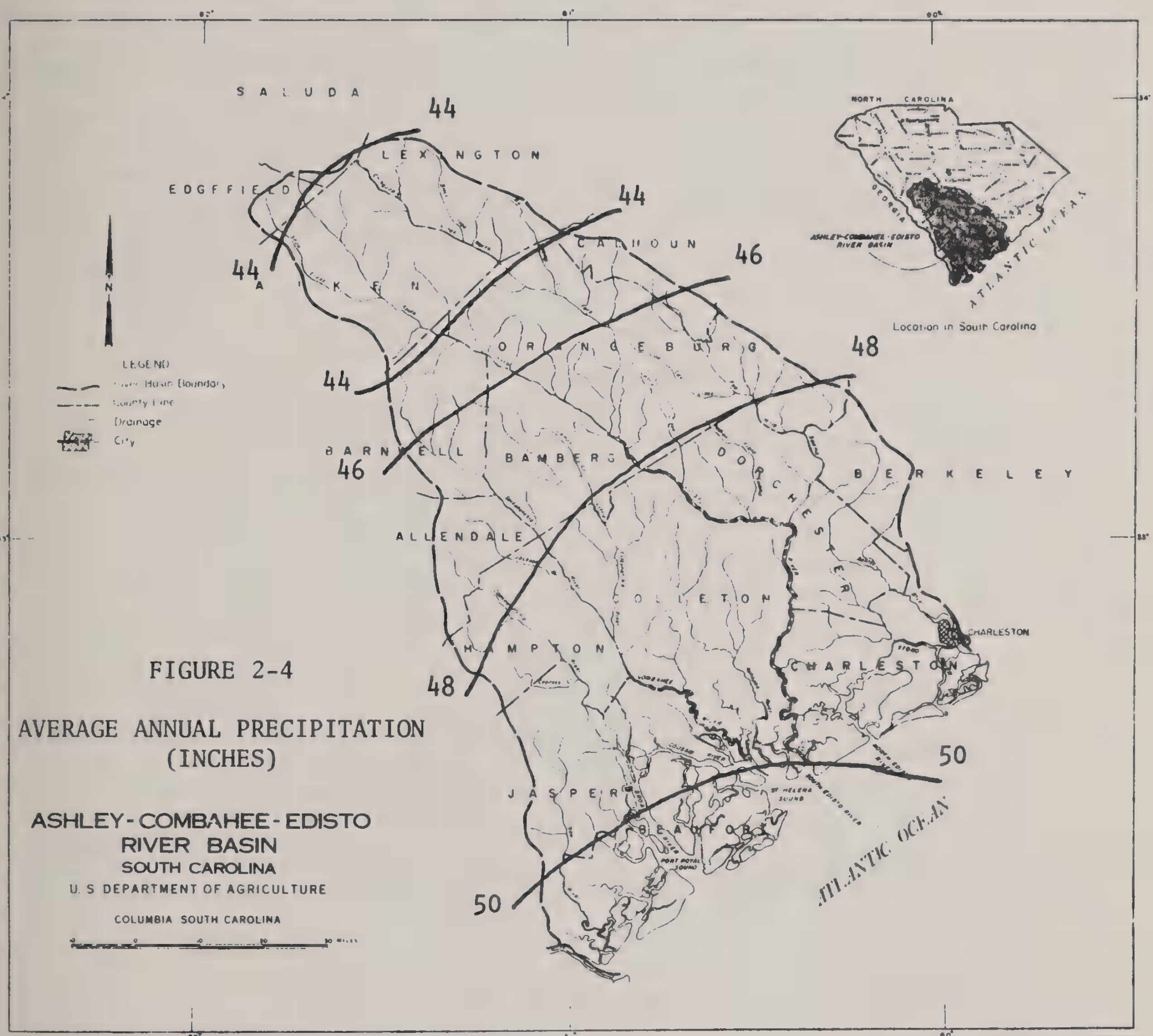
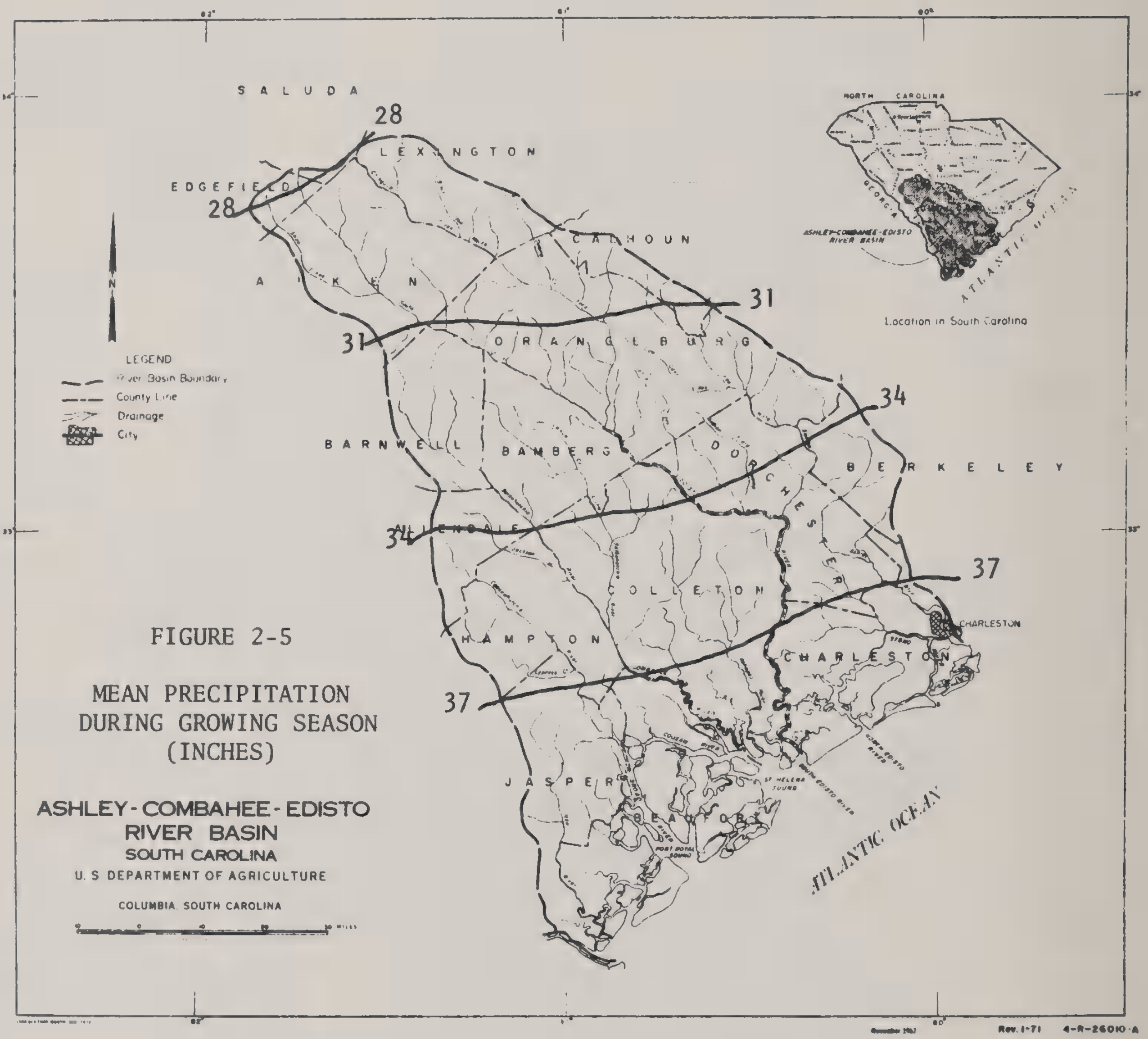


FIGURE 2-4

AVERAGE ANNUAL PRECIPITATION (INCHES)



SALUDA
LEXINGTON
EDGEFIELD
CALHOUN
AIKEN
ORANGEBURG
BARNWELL
BAMBERG
DORCHESTER
BERKELEY
ALLENDALE
COLLETON
HAMPTON
CHARLESTON
JASPER
BEAUFORT
ATLANTIC OCEAN
28
31
34
37
LEGEND
River Basin Boundary
County Line
Drainage
City
NORTH CAROLINA
GEORGIA
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
Location in South Carolina
FIGURE 2-5
MEAN PRECIPITATION DURING GROWING SEASON (INCHES)
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S DEPARTMENT OF AGRICULTURE
COLUMBIA, SOUTH CAROLINA
Rev. 1-71
4-R-26010-A

high winds, hail and considerable lightning and sometimes spawn tornadoes. Statewide, an average of 7 or 8 tornadoes occur per year. Sixty percent of the tornadoes occur from March through June with April being the peak month. Tropical storms or hurricanes affect the state about one year out of two and usually bring heavy rainfall.

The mean annual temperature for the basin is 64.7 degrees, which varies from a monthly mean of 80.4 degrees in July to a monthly mean of 48.9 degrees for December and January. Temperatures officially recorded range from a high of 106 degrees in September 1925 and August 1954 to a low of one degree below zero in February 1899.

The average length of the growing season is about 245 days throughout the basin. Some of the coastal islands in the southeastern part have growing seasons of 290 days. The growing season generally extends from mid-March to mid-November.

Geology and Physiography

Surface and Subsurface Geology 1/

The oldest rocks within the basin are of the Paleozoic Era, which had its beginning 570 million years ago. These are the crystalline hard rocks exposed in the Piedmont. They are also the basement material or foundation for all other rocks in the basin. Information concerning geologic conditions between deposition of the Paleozoic rocks and the adjacent younger rocks of the Coastal Plain is limited. Geologic studies are continuing to fill in this gap covering millions of years and thousands of feet of sediment deposition. The oldest Cretaceous sediment, Tuscaloosa Formation, dates approximately 90 million years back to its depositional beginning. Cross section X-X' on Figure 2-6 illustrates the general positions of all prominent sedimentary formations and the crystalline rock foundation. Generally, all of the sedimentary rock formations overlap the preceding older sediments and their dip is notably seaward. The appearance of each formation in the cross section is a seaward thickening, but in reality, there is considerable variance in thickness longitudinally for several of the formations. The name and geologic period of each formation is included in the legend on Figure 2-6.

The late Cretaceous formations are interfingered, but present an overall essentially transgressive relationship between fluvial, marginal marine and marine sediments. The Tertiary and Quaternary formations express near shore deposits inland and ocean shelf deposits seaward. The entire geologic section consists of marine deposits near the present coast. Most of these sediments consist of sand and clays with a content of sea shells and carbonate particles. Pleistocene and Recent terrace deposits cover much of the Tertiary formations in the southern three-fourths of the basin.

Due to its metamorphic and crystalline origin, the mineral content of the basement rock is distinct from those of the overlying sedimentary formations. The principal minerals associated with the Paleozoic rocks are amphibolite, quartz, feldspar (microcline) and mica (muscovite). Argillite, a rock common to the Carolina basement rocks, is essentially a hardened mudstone.

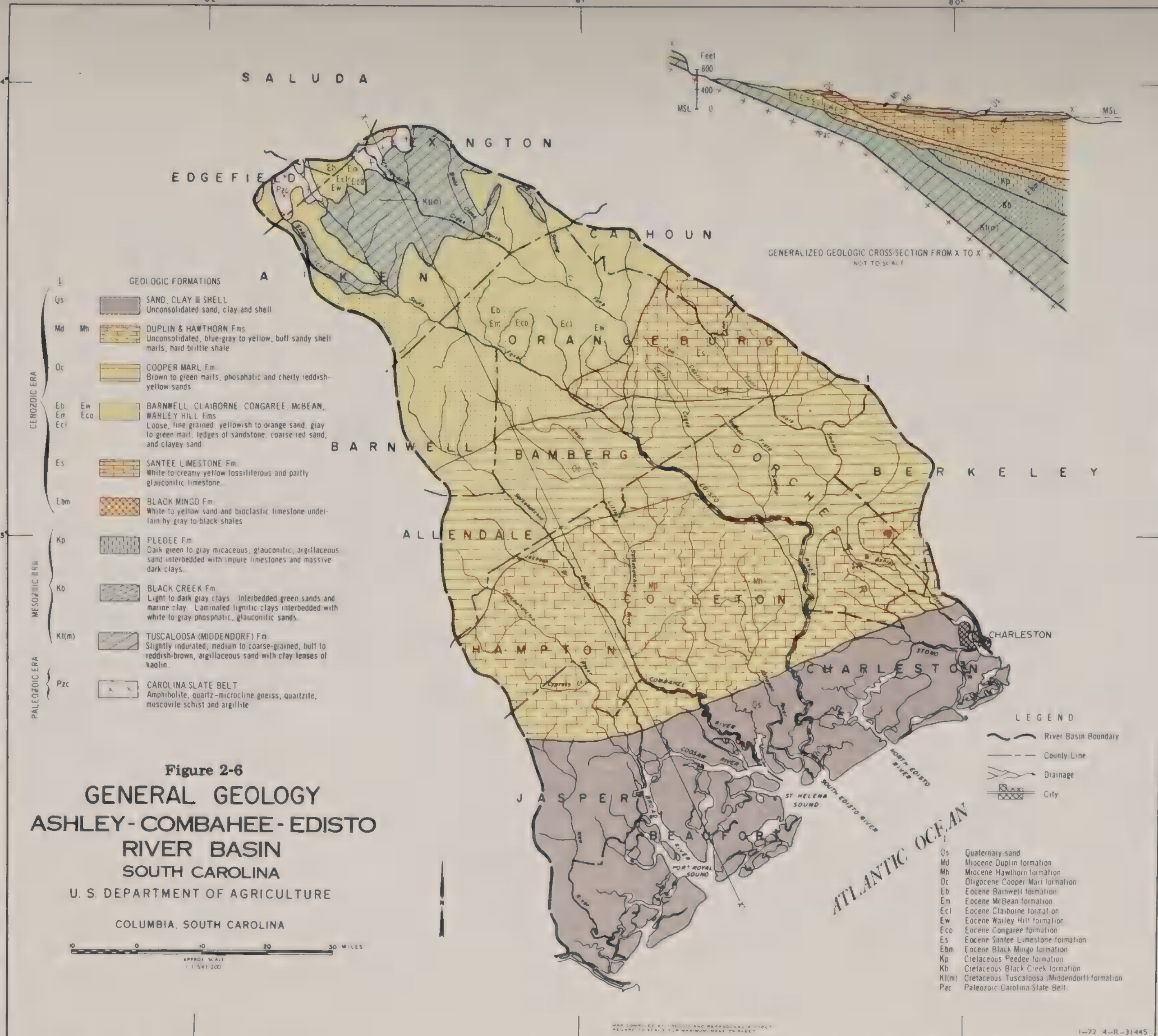


Figure 2-6

GENERAL GEOLOGY
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
COLUMBIA, SOUTH CAROLINA

USDA-SCS-FORT WORTH, TEXAS 1976 November 1967 Rev. 1-71 4-R-26010-A

The general mineralogy of the sedimentary formations in the basin is listed in Table 2-1.

Kaolinitic clay minerals generally are most abundant landward in the sedimentary rocks. Montmorillonitic and illitic clay minerals generally are most abundant seaward. The geologic section near the coast and seaward is predominately quartzitic or calcareous.

Physiographic Provinces and Topography

The basin extends from the Atlantic Ocean inland for a distance of 130 miles. The basin is predominately in the Coastal Plain, but intersects the Piedmont Province at the "fall line" near its northern boundary.

The Coastal Plain area consists of three distinct topographic land form regions - sandhills in the northeast basin area, a middle (Aiken) plateau in the northwest, and a series of terraces extending seaward. (See Figure 2-7.)

The topography of the sandhill area is one of long gentle slopes and rounded hilltops. The streams have cut deeply into the loose sands. The hills are generally 40 to 50 feet high. Elevations range from 300 to 600 feet above mean sea level (msl). (See Figure 2-8.)

The middle (Aiken) plateau was once a level plain, sloping southward. The transgressing streams have cut deeply into the soft sediment. The southern part of the plateau is flatter with shallow undrained depressions occurring at random. Solution of calcareous beds below the surface is the probable cause for these depressions. Within the basin, the plateau topography is highly dissected. Elevations are generally 150 to 550 feet above msl.

The seaward coastal terraces occupy approximately three-fourths of the basin. They extend from Orangeburg and Barnwell Counties to the coast. These terraces, or distinct land levels, are remnants of Pleistocene shorelines abandoned by a receding sea. The streams and other erosional forces have since removed considerable amounts of the materials deposited in these terraces. Shallow stream valleys and low gentle sloping land swells are typical of the area. The names and elevations of the terraces are as follows:

Terrace	Average Elevation Above Mean Sea Level (feet)
Brandywine	270
Coharie	215
Sunderland	170
Wicomico	100
Penholoway	70
Talbot	42
Pamlico	25
Princess Anne	17
Silver Bluff	8

TABLE 2-1: GENERAL MINERALOGY
OF THE SEDIMENTARY FORMATIONS

ACE BASIN

Formations	General Mineralogy
Recent -?- Pleistocene -?- Pliocene	Aragonite, Bentonite, Calcite, Phosphate, Quartz, Montmorillonite
Duplin	Aragonite, Calcite, Montmorillonite, Illite
Hawthorn	Phosphate, Montmorillonite, Illite
Cooper Marl	Aragonite, Calcite, Chert, Phosphate, Quartz
Barnwell, Claiborne, Congaree, Warley Hill	Aragonite, Calcite, Chert, Phosphate, Quartz
Santee Limestone, McBean	Aragonite, Calcite, Glauconite
Black Mingo	Aragonite, Calcite, Quartz, Montmorillonite (pre-consolidated)
Pee Dee	Aragonite, Calcite, Glauconite, Mica, Quartz, Montmorillonite
Black Creek	Montmorillonite, Glauconite, Lignite, Phosphate, Quartz
Tuscaloosa (Middendorf)	Montmorillonite, Kaolin, Quartz

FIGURE 2-7

GEOGRAPHIC DIVISIONS

ASHLEY-COMBAHEE-EDISTO
RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA, SOUTH CAROLINA

1-Brandywine
2-Coharie
3-Sunderland
4-Wicomico
5-Penholoway
6-Talbot
7-Pamlico
8-Princess Anne
-Silver Bluff & Recent

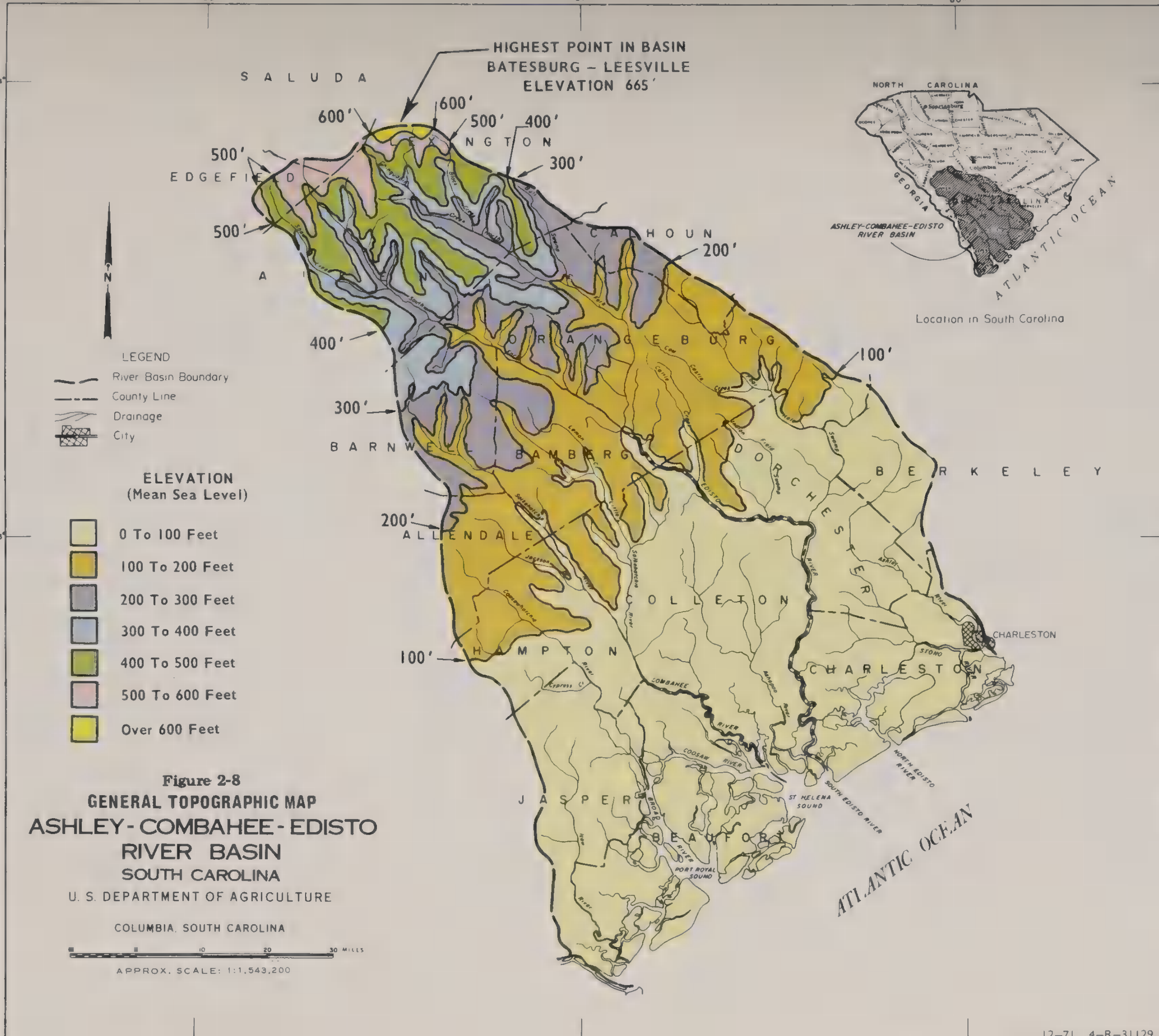


Figure 2-8
GENERAL TOPOGRAPHIC MAP
ASHLEY-COMBAHEE-EDISTO
RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA, SOUTH CAROLINA

USDA-SCS-FORT WORTH, TEXAS 1976

Beginning with a distinct drop above the Coharie Terrace, the general slope of the terraces is 3.0 feet per mile seaward. (See Figure 2-8.)

The coastline trends southwestward, but is cut by many bays, rivers and inlets into irregular land forms called "sea islands". The surfaces of these "islands" consist of sand, mud and shell fragments being deposited by both the freshwater streams and ocean tides. Elevations on the "islands" range from msl to 25 feet above msl.

Natural Scenic Features

The most popular scenic areas are along the Atlantic Coast. Sand, clear water and blue sky combine to attract vacationers to the warm semi-tropical islands, which are usually joined to the mainland by short bridges over a grassy tidal marsh.

Visitors may occasionally catch glimpses of flashing rapids in the northern tip of the area. Some people enjoy the crispness of the sandhills with their cover of scrub oak and pine. The Coastal Plain contains numerous quiet moist woodland drains, dense with water oaks, pines, tupelo and cypress. To many, the broader fields of soybeans, corn, cotton and tobacco on the drier divides are impressive.

Several reaches of the Coosawhatchie, Edisto and Combahee Rivers have been recognized as having potential for inclusion in the National Wild and Scenic River System. Appendix K is a description of the inventory. The following data shows the total miles of rivers with wild, scenic, historical or recreational values 2/:

River Systems	Wild	Scenic	Historic	Recreational
Coosawhatchie	-	-	-	24.2
Edisto	2.3	151.2	33.0	153.2
Combahee	-	49.2	41.1	49.2
Ashley	-	19.8	10.0	19.8

Commercial Mineral Resources

As of March 1975, mines in seven of the 13 counties in the basin were being operated. Thirty-three companies operate 59 mines and extract nine commodities. Commodities mined are kaoline, brick kaolin, brick clay, shale, glass and aggregate sand, gravel, peat and marl (limestone for aggregate and cement). Mining annually contributes an estimated 45 million dollars to the ACE Basin economy. The locations of mines, pits and quarries are shown on Figure 2-9 and a listing of the major companies and their products are shown in Table 2-2.

Limestone mined from the Santee Limestone and Cooper Marl formations is used in ready-mixed concrete, concrete products, building materials and agriculture. Hard limestone is also mined as crushed stone for road-base material. Sedimentary kaolin from the Tuscaloosa Formation is processed for the manufacture of fertilizer, firebrick, rubber, adhesives, paint, animal feed and paper. Unprocessed kaolin is used to face brick. Common clay

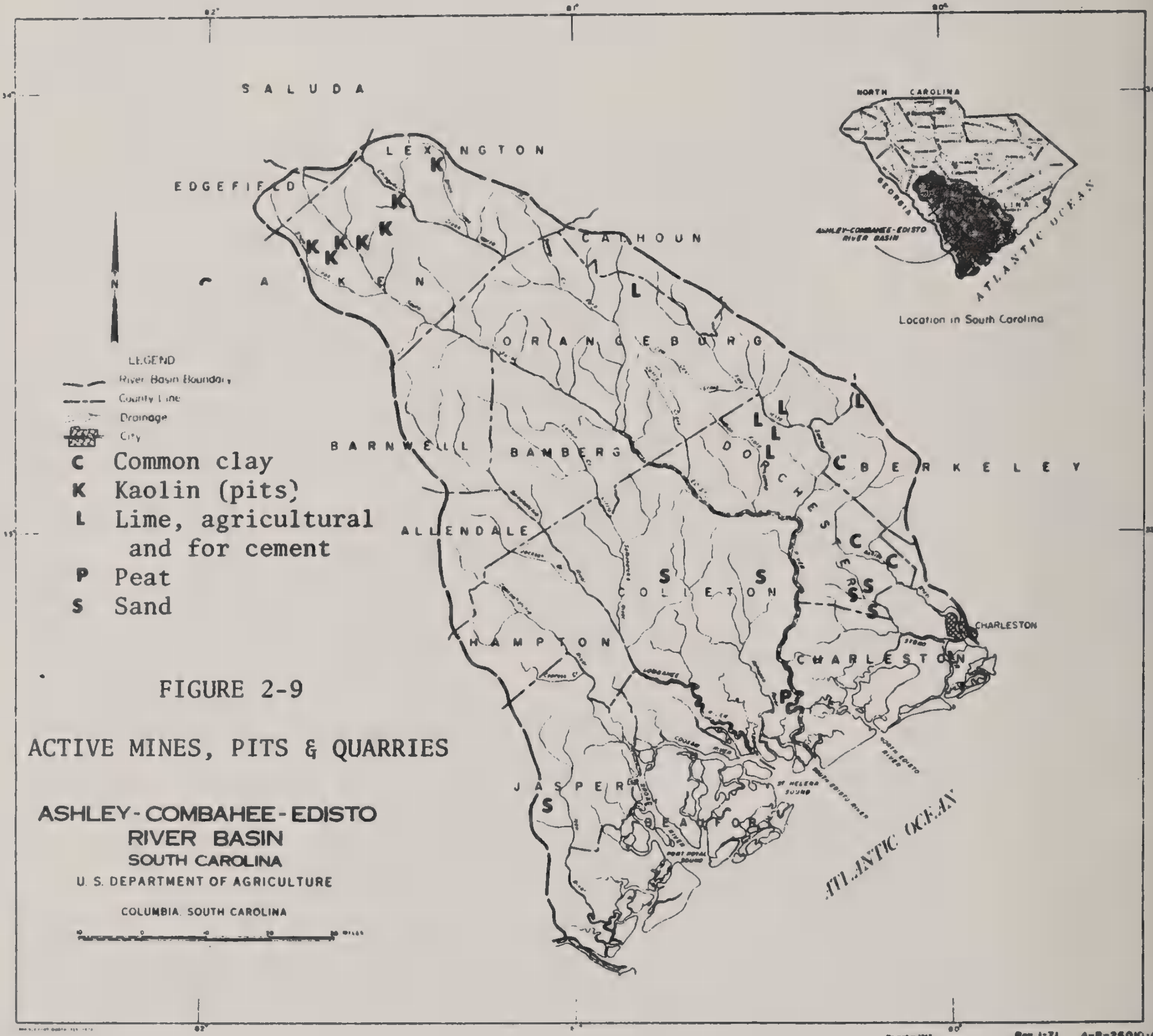


FIGURE 2-9

ACTIVE MINES, PITS & QUARRIES

TABLE 2-2: ACTIVE MINES, PITS AND QUARRIES

ACE BASIN

County	Company	Commodity
Aiken	Cyprus Industrial Minerals Co., Inc.	kaolin
	J. M. Huber Corporation	kaolin
	National Kaolin Products Company	kaolin
	Southern Brick Company	kaolin
	Southeastern Clay Company	kaolin
Berkeley	Dorchester Brick Works, Ltd.	clay
	Martin Marietta Aggregates	limestone (crushed stone)
Colleton	Nettles Sand Company	sand
	Santee Sand Company	sand
	U.S. Peat Corporation	peat
Dorchester	Becker Sand & Gravel Company	sand
	Dorchester Brick Works, Ltd.	clay
	Giant Portland Cement Company	limestone, clay
	Murray Sand Company	sand
	Salisbury Brick Corporation	clay
	Santee Sand Company	sand
Jasper	Deerfield Sand & Mining Co., Inc.	sand
Lexington	Guignard Brick Works	kaolin
	Herbert Anderson Jr., Construction, Inc.	sand
	Wilson Bros. Sand Company	sand
Orangeburg	Deerfield Sand & Mining Co., Inc.	sand
	Gifford-Hill and Co., Inc.	clay
	Santee Portland Cement Corporation	limestone, clay

NOTE: There are no active mines, pits or quarries in Allendale, Bamberg, Barnwell, Beaufort, Calhoun, Edgefield, Hampton and Saluda Counties.

containing alumina is also used in concrete. Peat is used primarily as a soil conditioner.

Phosphate was mined in the lower Coastal Plain between Beaufort and Charleston from 1867 to 1913. A cyclone in 1893, which destroyed nearly all the river phosphate plants and the discovery of richer phosphate deposits elsewhere combined to cripple this industry beyond recovery. Phosphate reserves estimated at nine million tons (1938), exist in the Beaufort to Charleston district, but presently are economically marginal. Fertilizer and phosphate chemicals are the primary uses of phosphate.

Investigations during the 1950's in South Carolina revealed that high grade heavy minerals (rutile, ilmenite, zircon, monazite) were associated with modern and ancient beach and dune deposits. Deposits on the modern islands along the coast will probably never be mined because of commercial development and environmental considerations. The valleys of the North and South Forks of the Edisto River are also possible locations of substantial heavy mineral deposits. Rutile and ilmenite are used to produce titanic iron ore for use as paint pigments and titanium metal. Zircon is the principal source of zirconium and hafnium, while cesium and thorium are derived from monazite.

It is unlikely that uranium minerals or fossil fuels will be found in substantial quantities in the basin.

The minerals of the basin provide an important resource upon which many areas of the economy depend. The most important of these are sand and gravel for aggregate and fill material, lime for cement, and kaolin for use in paints and high quality paper.

In 1973, the South Carolina General Assembly passed the South Carolina Mining Act, which provides for the protection of adjacent surface resources during mining and for the reclamation of mined land to a useful purpose. The Act became effective July 1, 1974, for purposes of reclamation.

Land Resources

Land Resource Areas

Parts of three major land resource areas make up the basin 3/. These are the Carolina-Georgia Sandhills (LRA 137), Southern Coastal Plain (LRA 133) and Atlantic Coast Flatwoods (LRA 153). A land resource area may occur in one continuous area or in discontinuous segments. Climate, soil conditions and land use vary among the land resource areas. Figure 2-10 shows the land resource areas.

The Carolina-Georgia Sandhills Land Resource Area makes up about 13 percent of the basin area and extends across the state adjacent to the "fall line" as an intermittent or irregularly shaped belt. Soils are generally developed from unconsolidated sand and have undergone slight to moderate erosion. Soils are mostly well drained to excessively drained. Some cotton, corn and soybeans are grown, but livestock and timber make up most of the agricultural economy. There is a diversity of forest types consisting of loblolly pine, longleaf pine, oak-hickory mixture and lesser amounts of hardwood-pine type. About 78 percent of the Sandhills LRA is forested.

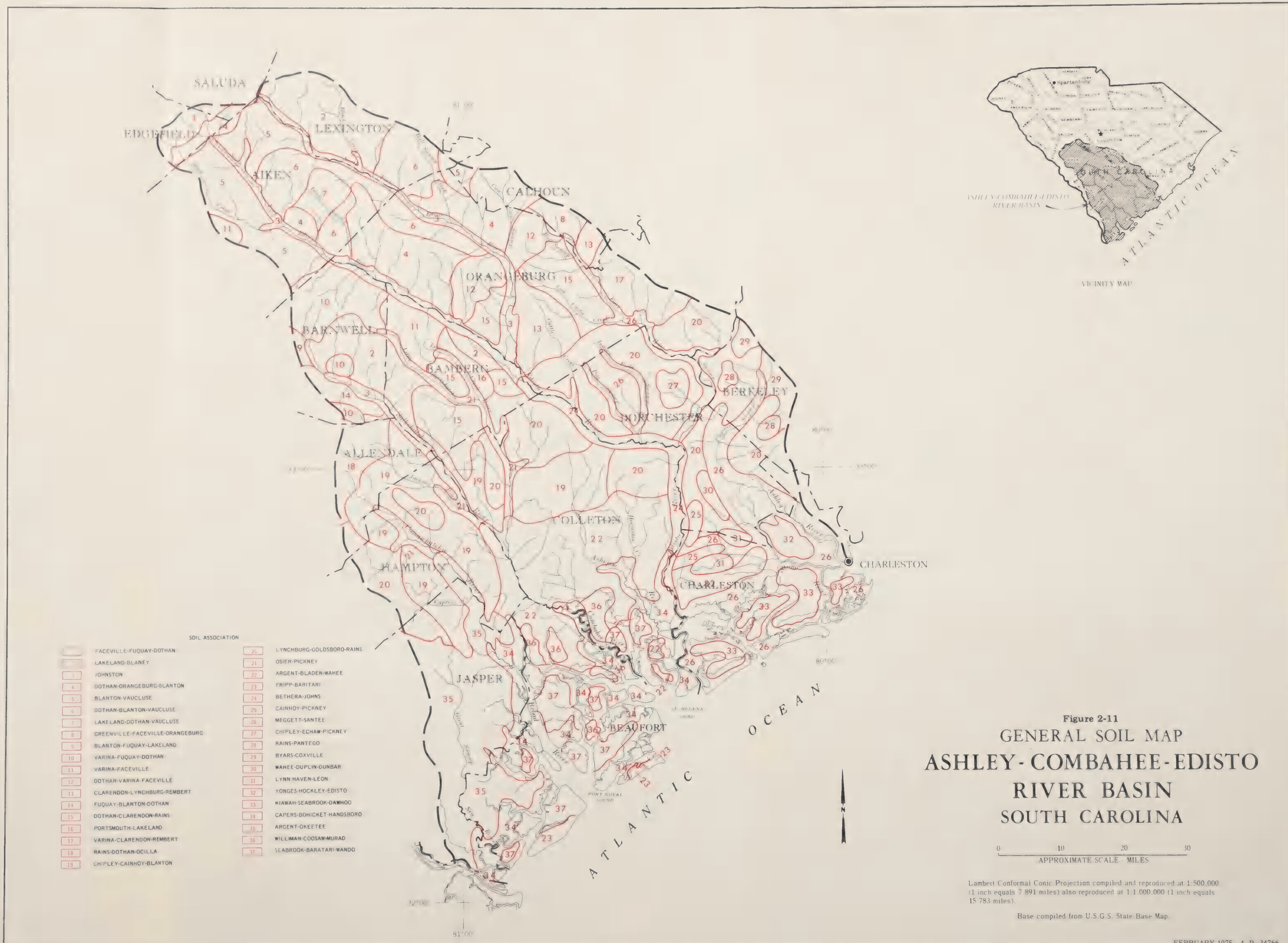


Figure 2-11

GENERAL SOIL MAP
ASHLEY - COMBAHEE - EDISTO RIVER BASIN
SOUTH CAROLINA

REVISED JANUARY 1975 4–R–26.010–A

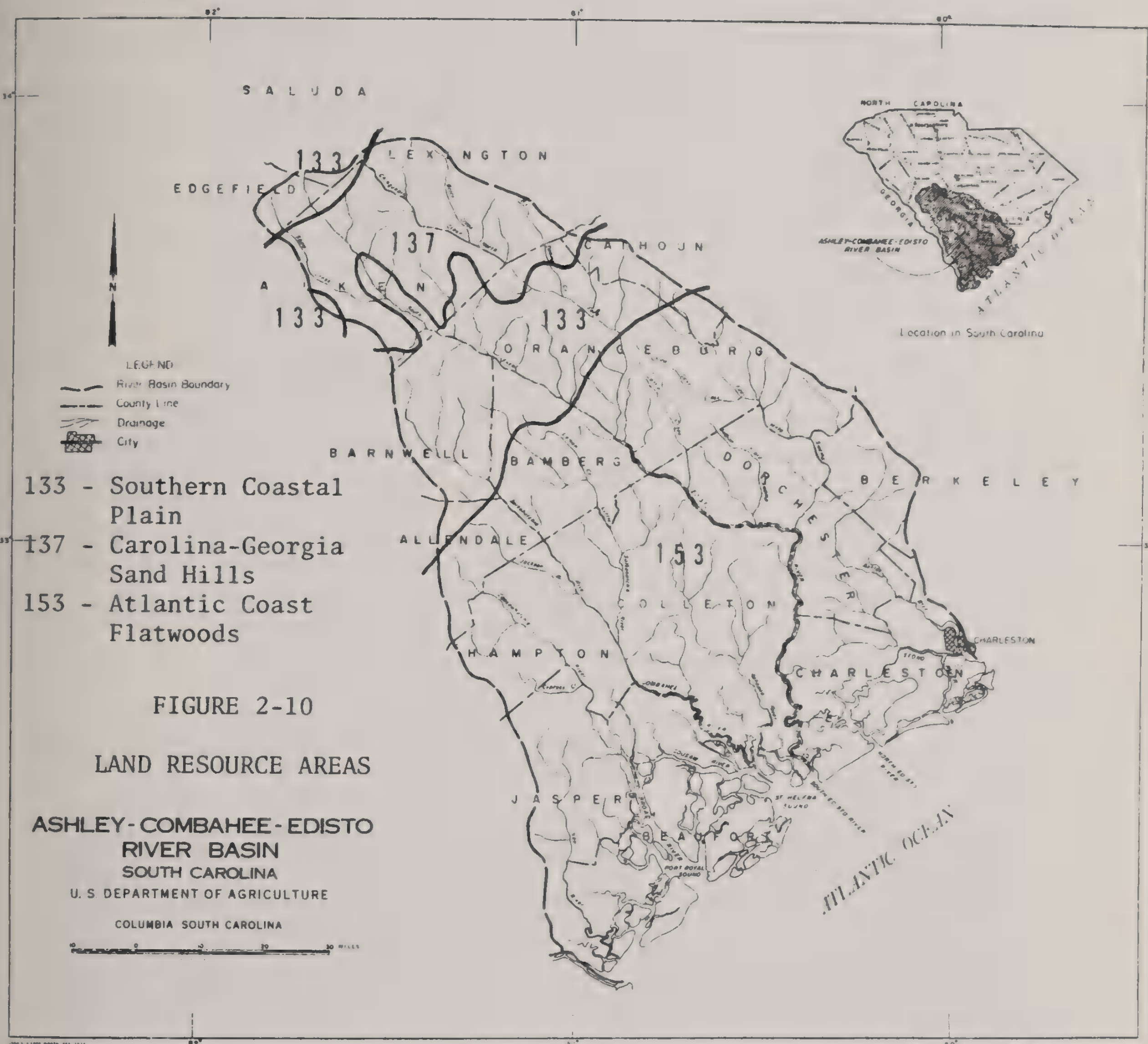


FIGURE 2-10

LAND RESOURCE AREAS

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
COLUMBIA SOUTH CAROLINA

The Southern Coastal Plain (often referred to as the Upper Coastal Plain) encompassing about 16 percent of the basin area, extends across the basin in an irregularly shaped belt from the Sandhills to a line through the City of Orangeburg and the Towns of Bamberg and Allendale. Small areas of the Southern Coastal Plain Land Resource Area are found within the Sandhills and near the Southern Piedmont. The area around the City of Aiken and portions of Edgefield and Saluda Counties are part of the Southern Coastal Plain. Cotton, corn and soybeans are major crops. Livestock production, especially dairying is important to the economy. Approximately 40 percent of the area is forested. Soils have developed from unconsolidated sands and clays and have slight to moderate erosion. Many soils of the Coastal Plain are poorly drained but soils on sandy slopes and ridges are often excessively drained.

The Atlantic Coast Flatwoods Land Resource Area extends from the Southern Coastal Plain to the Atlantic Ocean. About 71 percent of the basin area is in this LRA. The area can be divided into two regions for study purposes. The divide is at the top of the Talbot Terrace - about 42 msl. The higher area is often referred to as the Middle Coastal Plain and the coastal area is referred to as the Lower Coastal Plain. The area is well suited for farming. Corn and soybeans are the main crops. The major truck crop area of the state is found in this LRA. Forest land constitutes about 60 percent of the area and consists of a variety of forest types. Many of the larger tracts of land are managed for timber and wildlife production.

Soils have developed from nearly level beds of unconsolidated sands, clays and soft limestones. Erosion has been slight. Most of the soils are poorly drained. Extensive areas of tidal marshlands occur along the coast and extend for several miles up each of the rivers. Wildlife and recreation resources are important in this area.

Soil Associations and Suitability General Interpretations

The South Carolina Agricultural Experiment Station (Clemson University) in cooperation with the Soil Conservation Service, has prepared general soil association maps for each county in the state. These maps give broad areas of soils groupings and the dominant soils in each group and are designed only for broad planning. General soil associations are shown on Figure 2-11.

Detailed soil surveys are being made for the entire basin. All field mapping has been completed for Saluda, Lexington, Calhoun, Barnwell, Bamberg, Berkeley, Charleston, Beaufort and Jasper Counties. Soil survey reports have been published for Saluda, Bamberg, Calhoun and Charleston Counties. Progressive mapping is underway in Colleton and Aiken Counties and the field work is expected to be complete by 1979. Some mapping has been done in Orangeburg, Dorchester, Allendale and Hampton Counties, and field work in these counties should be complete in 1983. Soil surveys contain information that can be applied in managing farms and woodlands, in selecting sites for roads, ponds, buildings and other structures, and in judging the suitability of tracts of land for farming, industry and recreation. A detailed on-site soils investigation should be a part of detailed planning of land use. Copies of published soil survey reports and detailed soil surveys are available from libraries, Soil Conservation Service field offices,

county agents, vocational agricultural teachers, and other sources. Appendix A shows soil limitation interpretations for the major soils in the basin for certain uses.

Land Use Distribution

Major land use classifications included in this chapter are the same as those described in the report, South Carolina Soil and Water Conservation Needs Inventory 4/.

The basin contains 4,475,876 acres. Based on the 1970 CNI Report, 3,770,387 acres of the total area are agricultural and forest lands. Of this, 1,118,916 acres are cropland and pastureland and 2,651,471 acres are forest lands. There are 349,540 acres in other agriculturally related uses such as farmsteads, farm roads, feed lots, etc. Nonagricultural use accounts for the remainder and includes 204,559 acres of urban and built-up areas and 151,390 acres of water. (See Table 2-3 for land distribution.)

Soybeans, cotton, corn, small grain, and forage crops occupy most of the cropland acreage. Even though they require fewer acres, truck crops are important to the basin's economy. In the upper portion of the basin, peaches, vegetables and grapes are grown. Watermelons, peanuts, tomatoes and other vegetables are grown in the central counties. Along the coast, cucumbers, tomatoes, leafy vegetables and other truck crops are produced on a large scale. Often two or three crops are grown on the fields each year. Markets in Columbia, as well as those in the northeastern part of the country are important to the truck crop industry.

Peaches are grown in almost every county of the basin.

TABLE 2-3: LAND USE

ACE BASIN

County	Total Area Within Basin	Cropland	Pasture	Forest	Urban & Built-Up	Small Water	Large Water	Other Land
	(acres)							
Aiken	345,114	77,289	10,081	238,588	13,200	3,140	760	2,056
Allendale	118,732	46,840	5,576	56,879	5,100	650	230	3,457
Bamberg	252,800	97,142	12,894	132,598	5,580	1,250	-	3,336
Barnwell	202,574	81,952	9,756	101,465	7,540	900	340	621
Beaufort	444,800	44,381	10,000	153,034	32,758	2,260	74,500	127,867
Berkeley	183,139	10,614	2,739	158,673	1,160	420	60	9,473
Calhoun	71,488	29,104	2,297	34,279	2,950	810	-	2,048
Charleston	368,263	28,331	12,506	172,187	38,864	2,500	36,800	77,075
Colleton	678,400	103,300	28,000	482,300	26,911	3,060	7,400	27,429
Dorchester	362,160	56,181	8,535	278,790	5,041	1,280	280	14,053
Edgefield	37,939	21,498	3,280	10,932	1,200	570	-	459
Hampton	264,438	54,012	7,365	182,905	17,500	520	840	1,296
Jasper	312,985	41,269	5,896	200,450	9,100	610	5,570	50,090
Lexington	160,360	35,387	5,960	103,637	5,200	1,560	500	8,116
Orangeburg	663,112	242,760	21,515	340,060	32,280	3,720	640	22,137
Saluda	7,572	1,228	1,228	4,694	175	220	-	27
TOTAL	4,475,876	971,288	147,628	2,651,471	204,559	23,470	127,920	349,540
PERCENT	100.0	21.70	3.30	59.24	4.57	0.52	2.86	7.81

SOURCE: South Carolina Conservation Needs Committee, South Carolina Soil and Water Conservation Needs Inventory, State Soil Conservation Committee, Columbia, South Carolina, 1970.

Coastal Bermuda grass, Bahia grass and lespedeza sericea are the primary pasture crops. Annual grazing crops are planted to supplement both summer and winter feedings. Beef cattle, hogs and dairy cattle are found throughout the area. The climate allows year-round grazing.

Timber covers 59 percent of the basin's land area. Commercial timber stands account for 2,646,044 acres. An additional 5,427 acres produce commercial timber but are not available for harvesting. Commercial timber stands support six major forest types. (See Table 2-4.) Hardwood timber types represent 47 percent of all commercial forest stands, pine timber accounts for 37 percent and the remaining 16 percent is a mixture of oaks and pines. Figure 2-12 shows major forest types within the basin.

More than half of the basin's land is forested.
(Photograph courtesy of South Carolina State Commission of Forestry)

Acreage used for growing trees has fluctuated over the past several decades. The forest survey of 1968, records a five percent increase in forest land acreage over the period 1958-1968. Another change occurred during the same decade - land in hardwood timber dropped four percent. Conversion of hardwood stands to pine and reforestation and natural seeding of idle abandoned land account for much of the increase in timber acreage.

Some of the best hardwood timber growth occurs on wetland sites. Deep swamps, bays and wet pocosins account for 212,400 acres or eight percent of the commercial forest acreage. The average growth rate over the basin is 50 cubic feet per acre per year and growth rates on

TABLE 2-4: FORREST TYPES

ACE BASIN

Type	Acres	Percent of Total	Net Annual Growth (thousand cu.ft.)
Oak-gum-cypress	751,137	28	60,464.65
Oak-hickory	313,798	12	12,760.05
Loblolly-shortleaf	381,283	14	17,158.50
Longleaf-slash	433,099	17	14,682.40
Oak-pine	430,959	16	17,587.74
Elm-ash-cottonwood	22,568	1	1,585.16
Miscellaneous softwoods	149,152	6	7,327.83
Miscellaneous hardwoods	164,048	6	880.67
TOTAL	2,646,044 1/	100	132,446.00

SOURCE: U.S. Department of Agriculture, South Carolina Timber, 1968, Resource Bulletin SE-13, Southeastern Forest Experiment Station, Asheville, North Carolina, 1969.

1/ This total does not include 5,427 acres of forest land classified as either "productive-reserve" or "non-productive". Table 2-3, Land Use, includes the 5,427 acres in forest land.

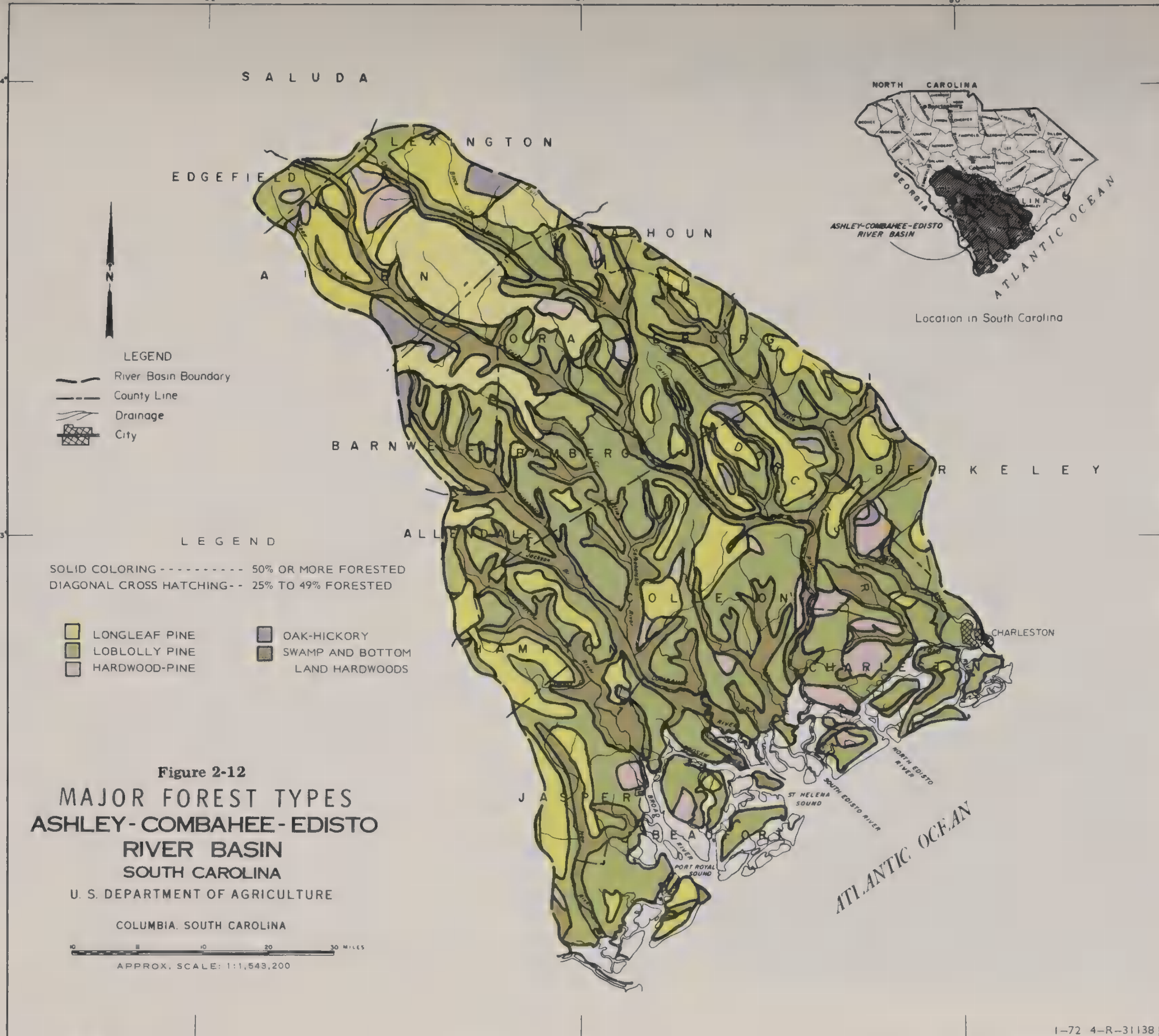


Figure 2-12

MAJOR FOREST TYPES
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA, SOUTH CAROLINA

USDA-SCS-FORT WORTH, TEXAS 1976

November 1967 Rev. 1-71 4-R-26010-A

the wet sites range from 63 cubic feet to 80 cubic feet. The average stand volume for all basin timber is 1,222 cubic feet per acre; wet soils support volumes from 1,306 to 3,419 cubic feet per acre.

Wooded swamps are some of the most valuable wetlands.

Land Management and Ownership Patterns

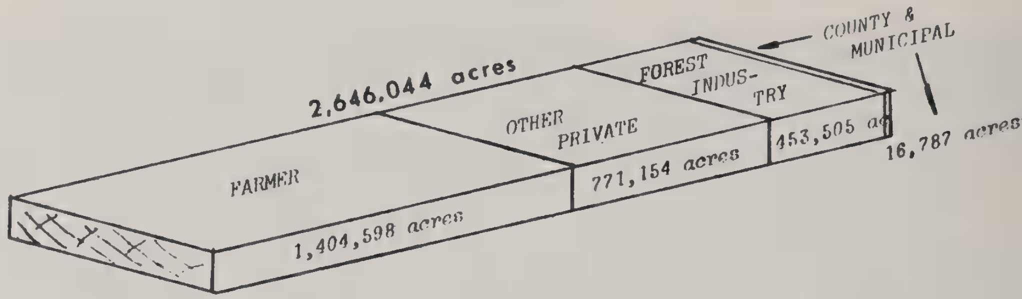
Excluding tidelands, more than 97 percent of the land in the basin is in private ownership. Most of the agricultural land is composed of family-type farms, even though ownership is gradually changing to larger holdings for more efficient use of farm machinery. In recent years, many of the smaller less efficient units are being rented by larger operators. Each year some agricultural and forest lands are converted to urban and built-up areas. This is most evident around the larger areas, such as Charleston, Beaufort, Orangeburg, Summerville and Aiken. There is a trend toward spillover from Savannah into Jasper and Beaufort Counties.

Public ownership accounts for less than one percent of forest lands in the basin. Forest industries manage 17 percent of all timber stands. Major firms are International Paper, Georgia-Pacific, Continental Can, Westvaco, Cox Woodlands, Union-Camp, Champion International, Catawba Timber Company, Kimberly-Clark, and Holly Hill Lumber Company.

In 1958, farmers owned 76 percent of the private timber holdings, but by 1968, farm timber holdings had dropped to 66 percent. The acres transferring from farm-type operations reappear under other private holdings. This newly emerging group represents those owners who do not depend upon forest resources for their livelihood. Professional

people, wage earners and business operators make up this growing segment of private forest landowners.

Ownership of commercial forest land is as follows 5/:



Near the coast, there are many large land holdings referred to as plantations which are owned by absentee landowners and used primarily for hunting.

Federal ownership in the basin is devoted primarily to military purposes and is located near Charleston, Beaufort and North. There are no National Forest lands in the basin. Excluding tidelands, state owned land amounts to 102,834 acres and is devoted to such uses as parks, fisheries, game areas, highway rights-of-way, maintenance facilities, observation towers and correctional, medical and research institutions 6/. An estimated 240,000 acres of tidelands could be in state ownership.

Undisturbed natural areas, such as swamps and estuaries still exist in the basin. These areas are essential to the basin's economy as well as its environment. Commercial and sports fisheries depend upon estuaries to provide the environment required by aquatic life. Estuaries also serve as a buffer between the ocean and the main land.

Four Hole Swamp, 35 miles northwest of Charleston, is an example of a natural area worthy of preservation. Other examples of natural areas include estuaries of Port Royal Sound and St. Helena Sound and the channels and adjacent land of such streams as the Coosawhatchie, Salkehatchie, Edisto and Ashley Rivers.

Streams in the Coastal Plain were inventoried by the South Carolina Water Resources Commission in 1971 for consideration under the National Wild and Scenic River System 7/. Presently, no streams in the basin have a national wild and/or scenic river designation.

Surface Water

Surface water is that part of the hydrologic cycle that results from precipitation and appears as streamflow - direct surface runoff and outflow of ground water into streams. Therefore, streamflow - whether natural or impounded and regulated by man - is a measure of surface water availability.

The average annual rainfall over the basin is 48 inches and the average annual runoff ranges from 10 to 14 inches. (See Figure 2-13.) These factors, in conjunction with good topographic features, have promoted the development of many water impoundments and dug pits throughout the area.

Streams: There are approximately 2,400 miles of perennial streams and about the same mileage of intermittent streams. Ephemeral streams are too numerous to measure. The swamps and flow areas associated with these streams could be considered as temporary holding basins for heavy precipitation, but seepage, evaporation and transpiration limit the usefulness of these basins. The flow of water in the rivers and streams constitutes the major surface water resources of the area. The three major rivers (Ashley, Combahee and Edisto) are described as follows:

Originating in Great Cypress Swamp in an area of low relief, the Ashley River exhibits the marked degree of flow variability typical of coastal plain streams. According to areal generalizations, the minimum flow recedes to zero during prolonged dry weather periods, while a flood flow at the 25 year frequency probably exceeds 15 cubic feet per second (cfs) per square mile. The average annual flow, 0.7 cfs per square mile, is exceeded only about 30 percent of the time. The Ashley River then, can be expected to discharge a substantial volume of fresh water only after periods of heavy precipitation, be sustained at base flow when the water table is high and recede to little or no flow during dry weather.

The river stage conforms to the cyclic pattern of tidal influence in the lower half of the reach. Approaching the coast, the drainage basin attains less relief, fresh water tributary inflow is minimal and saline intrusion is increasingly apparent.

From the headwaters of the Salkehatchie River rising in the upper coastal plain, the Combahee River is afforded a better sustained low flow during rainless periods than streams originating nearer the sea. Consequently, the variability of flow is less pronounced. Representative of the upper reach, the Salkehatchie River near Miley, 44 miles from the headwaters, has an average discharge for 20 years of record of 322 cfs, or 0.94 cfs per square mile. The minimum flow has been 17 cfs and the maximum 2,340 cfs.

It is more interesting to observe the contrast in characteristics of the Combahee in the transition from the upper reach to lower coastal plain by comparing the streamflow at Miley with that at Combahee River near Yemassee, 27 miles downstream. Average flow at

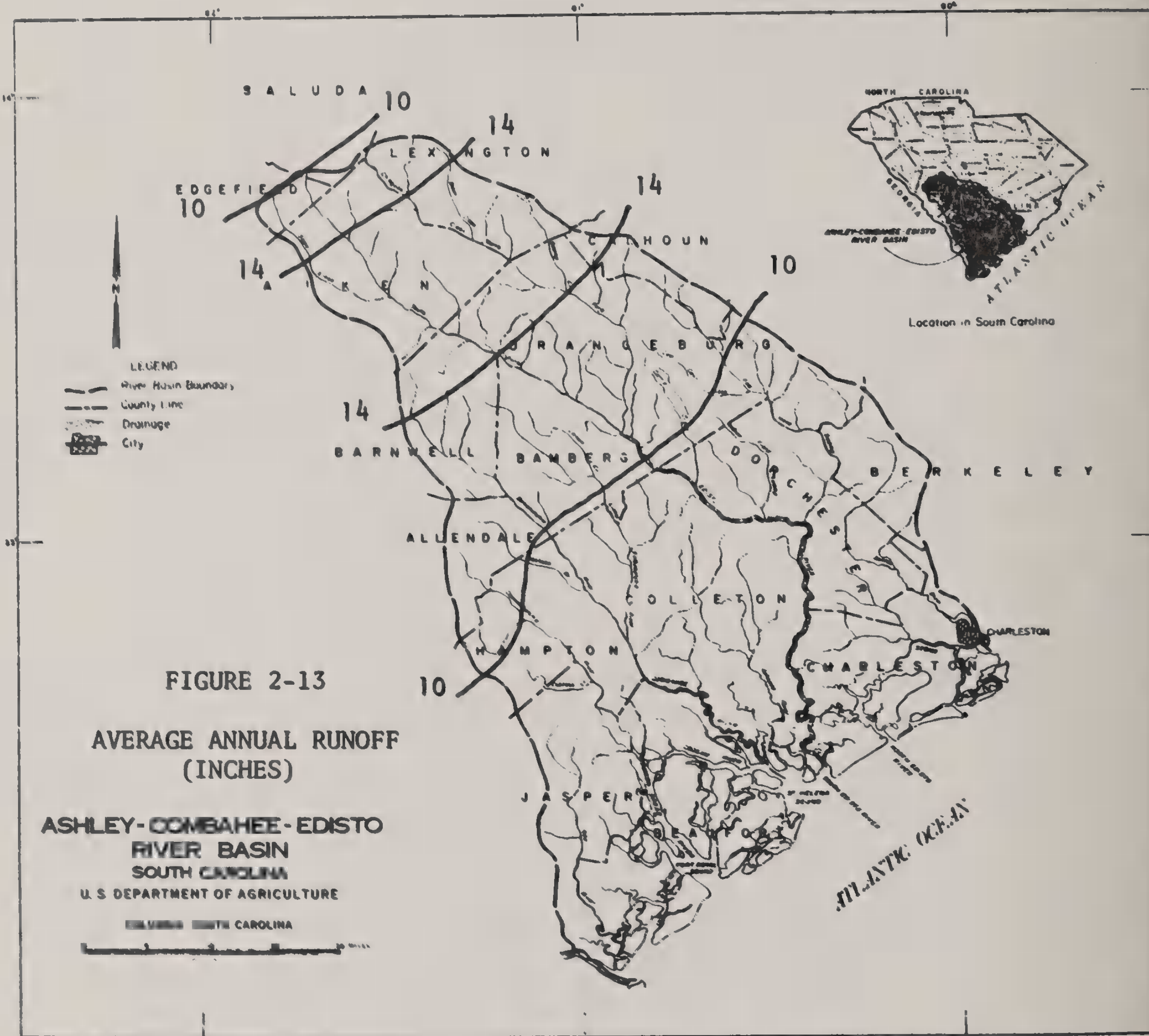


FIGURE 2-13

AVERAGE ANNUAL RUNOFF
(INCHES)

SOURCE: U.S. Department of the Interior, Geological Survey, Surface Water Supply of the United States, South Atlantic Slope Basins, James River to Savannah River (issues 1929-1960), Washington, D.C., Government Printing Office.
U.S. Department of the Interior, Geological Survey, Surface Water Records of South Carolina (issues 1961 through 1965), Washington,D.C., Government Printing Office.

Yemassee for six years of record was 483 cfs, or 0.44 cfs per square mile and at Miley 223 cfs, or 0.65 cfs per square mile for the same period, a reduction in the fresh water contribution of 0.21 cfs per square mile for an increase in drainage area of 760 square miles or a net deficiency of about 0.31 cfs per square mile for the intervening drainage.

Extreme low flows are comparable, given equitable evapotranspiration losses and emphasize the decrease in ground water inflow between the two sites. The 1954 drought produced flows of 17 cfs at Miley and nine cfs at Yemassee or 0.05 and about 0.01 cfs per square mile, respectively. In other words, the yield per unit area of the intervening drainage (70 percent of the total area above Yemassee) was only 20 percent of that above Miley.

Streamflow at the other extreme, flood flows, surprisingly affords no diminution of unit runoff in the downstream progression of this stream. Because of the high water table in the relatively narrow swamp areas, the soil becomes quickly saturated. A large proportion of the precipitation does not seep into the ground but serves as overbank storage to promote and sustain the flood. For example, a flood of the 25 year frequency at Miley produces a peak runoff of 7.7 cfs per square mile, while for the same flood at Yemassee, the runoff would escalate to about 17 cfs per square mile.

This characteristic is atypical of coastal plain streams where generally the lesser defined flood peaks are a result of poorly developed drainage.

The tidal influence on stage is evident at Yemassee and the Combahee River soon displays estuarine characteristics that are well developed within about 10 miles downstream.

Largest of the three streams in the study area, the Edisto River discharges by far the greatest amount of fresh water. More than 40 percent of the drainage area lies within the upper coastal plain where ground water inflow maintains a well sustained base flow in the streams, even in dry weather.

The streamflow characteristics are well defined from 30 years of record. Where the North and South Forks of the Edisto reach the lower limit of the upper coastal plain (an intersecting line connecting Bamberg and Orangeburg) the average flow is about 1.12 cfs per square mile, minimum is 0.20 cfs per square mile and maximum flow has reached 24 cfs per square mile.

Typically base flow contribution on a unit area basis to the Edisto decreases in the lower coastal plain. The Edisto River near Givhans has a drainage area nearly double that of its reach in the upper coastal plain, yet the minimum flow of record is 0.14 cfs per square mile or an overall decrease of 0.06 cfs per square mile and a net deficiency of about 0.15 cfs per square mile from the intervening drainage. The average discharge shows a decrease of about 12 percent to 0.99 cfs per square mile largely from the diminished base flow contribution.

Flood peaks also decrease on a unit area basis in the downstream direction. As the terrain develops less relief, the swamplands become more extensive, retain a larger proportion of precipitation, and in effect flatten the flood peak while prolonging the duration of overbank flow. The 25 year peak attains about 10 cfs per square

mile in the upper coastal plain as compared with 8.4 cfs per square mile at Givhans.

Tidal influence is reportedly evident about 20 miles downstream from Givhans and saltwater encroachment is detectable at times 4.5 miles south of Jacksonboro. Below this limit, the Edisto River develops preliminary estuarine characteristics which become better defined as the channel declines below sea level.

In summation, the streams of the study area that originate in the upper coastal plain discharge the greater volume of water. For example, low flow is much better sustained and the variability of flow less extreme in the Edisto and Combahee Rivers than in the Ashley River. It is estimated that from the Ashley-Combahee-Edisto Basin, the average fresh water discharge is about 3,500 cfs, the minimum flow in a severe drought about 300 cfs (with no contribution from the Ashley River) and that a 25 year flood would discharge in excess of 45,000 cfs. Figure 2-14 shows average stream discharge, 7 day-10 year low flow and minimum flow for the drought of 1954 for the gaging stations in the basin.

Lakes and Ponds: In the basin, there are 4,356 ponds and lakes, of which 405 are 10 acres or greater and 3,951 are less than ten acres in size. Thirty-two of the lakes are 100 acres or larger in size. The three largest lakes are Maybank Brothers (a 400 acre lake in Charleston County), Bear Island (an 800 acre lake in Colleton County) and Lake Warren (a 600 acre lake in Hampton County). The total surface area of all lakes and ponds is 29,589 acres and the total storage capacity is 133,271 acre feet 8/. Table 2-5 shows the number, size and capacity of lakes and ponds in the basin. Existing lakes with surface areas 100 acres or greater are listed in Table 2-6 and their locations are shown on Figure 2-15.

There are numerous pond and lake sites available in the basin for future development. Appendix B is a list of potential sites for large impoundments.

Surface Water Quality: The surface waters of the basin are generally of excellent natural quality. Water at most locations in the basin is suitable for most domestic, industrial and agricultural uses.

Water is characterized by a low dissolved solids content and low concentration of individual dissolved substances. Normally the water contains considerable organic matter which results in a dark color. Specific dissolved materials may be of great importance when the water is to be used for some special purpose(s). These dissolved materials can usually be removed by treatment. Chemical constituents commonly found in natural water, their sources and effects are shown in Appendix C. Results of samples analyzed by the U.S. Geological Survey are presented in Appendix D. Pollution parameters other than those listed in the Appendices are available in the Edisto-Combahee Section (03-09) of the "Annual Water Quality Assessment 305(b) Report", South Carolina Department of Health and Environmental Control, April 1976.

Surface water temperatures in the basin range from a low of approximately 42°F in the winter to a high of approximately 82°F in the summer. The streams supply water at temperatures suitable for most water use requirements.

FIGURE 2-14

STREAM DISCHARGE
ASHLEY-COMBAHEE-EDISTO
RIVER BASIN
SOUTH CAROLINA

1730 — Station No.

792 — Average discharge (cfs)

191 — 7-day, 10-year minimum flow (cfs)

0.238 — Minimum stream flow in cfs per square mile, drought of 1954

● Station location

TABLE 2-5: INVENTORY OF LAKES AND PONDS

ACE BASIN

County	Greater than 100 Acres (No.)	50-100 Acres (No.)	10-50 Acres (No.)	Less than 10 Acres (No.)	Total (No.)	Total Surface Area (Acres)	Total Capacity (Acre-feet)
Aiken	2	6	64	464	536	3,688	17,283
Allendale	1	1	9	86	97	613	2,662
Bamberg	-	-	18	255	273	1,132	5,733
Barnwell	2	1	15	190	203	1,277	5,630
Beaufort	4	4	22	99	129	1,662	5,120
Berkeley	-	1	2	39	42	1,465	9,255
Calhoun	-	-	13	240	253	1,371	7,042
Charleston	7	6	26	115	154	2,249	8,253
Colleton	7	5	20	374	406	4,417	11,205
Dorchester	2	1	7	372	382	1,318	5,500
Edgefield	-	-	19	124	143	714	4,672
Hampton	2	-	10	60	72	1,184	5,823
Jasper	-	1	24	70	95	873	4,205
Lexington	1	5	33	409	448	2,425	12,538
Orangeburg	4	2	57	974	1,037	4,910	26,884
Saluda	-	-	1	80	81	291	1,466
TOTAL	32	33	340	3,951	4,356	29,589	133,271

SOURCE: South Carolina Water Resources Commission, Inventory of Lakes in South Carolina, Ten Acres or More in Surface Area, Report No. 119, Columbia, South Carolina, 1974.

TABLE 2-6: EXISTING LAKES
100 ACRES OR GREATER IN SIZE

ACE BASIN

County	Number 1/	Stream Location	Surface Area (Acres)	Storage (Ac.Ft.)
Aiken	1	Shaw Creek 2/	125	625
	2	Giddy Swamp Creek	200	2,000
Allendale	3	Jackson Creek 2/	170	630
Barnwell	4	Turkey Creek 3/	133	426
	5	Bentlegs Branch	150	400
Beaufort	6	Pocotaligo River Tributary	103	410
	7	Branford Creek	220	660
	8	Ballast Creek	206	618
	9	Brickyard Creek	170	680
Charleston	10	South Edisto River Tributary	100	200
	11	South Edisto River Tributary	110	220
	12	Fishing Creek	400	800
	13	Gibson Creek	125	1,000
	14	Chaplin Creek (salt water)	120	480
	15	Ashley River Tributary 3/	100	400
	16	Ashley River Tributary 3/	100	400
Colleton	17	Combahee River Tributary	150	300
	18	Combahee River Tributary	300	360
	19	Combahee River Tributary	100	240
	20	Horseshoe Creek	140	210
	21	Deer Creek Tributary	135	810
	22	Ashepoo River Tributary	800	2,400
	23	Sampson Island Creek 2/	150	240
Dorchester	24	Four Hole Swamp Tributary	100	1,000
	25	Walnut Branch Tributary	100	320
Hampton	26	Black Creek 3/	600	3,600
	27	Buckfield Branch	240	576
Lexington	28	Black Creek	150	600
Orangeburg	29	Dean Swamp	100	600
	30	Bull Swamp Creek	100	480
	31	Caw Caw Swamp Creek	100	320
	32	Caw Caw Swamp Creek Tributary	100	320

SOURCE: South Carolina Water Resources Commission, *Inventory of Lakes in South Carolina, Ten Acres or More in Surface Area*, Report No. 119, Columbia, South Carolina, 1974.

1/ Numbers correspond to locations shown on Figure 2-15, Existing Large Lakes.

2/ Lakes that are open to public for a fee.

3/ Lakes that are open for public recreation.

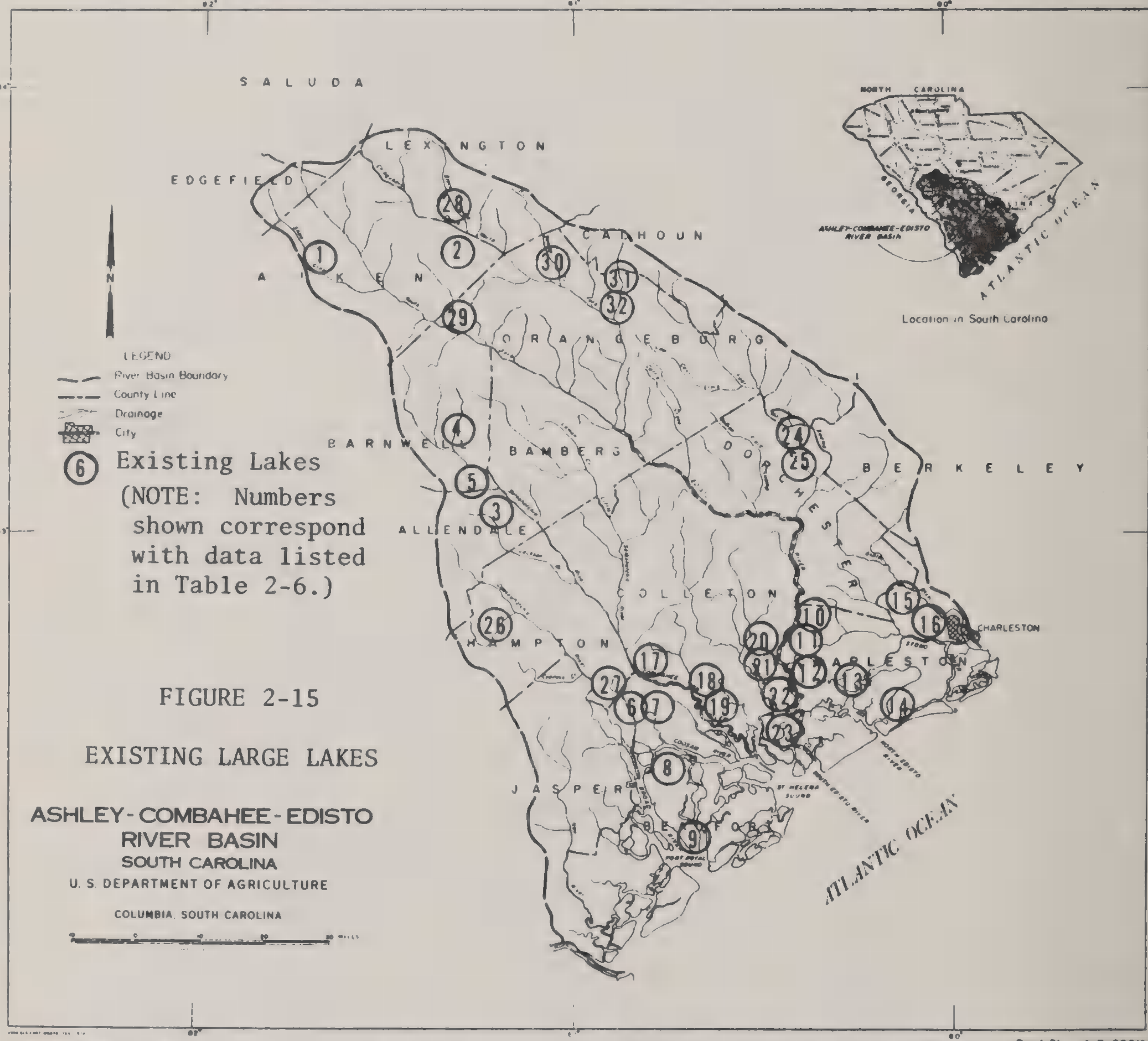


FIGURE 2-15

EXISTING LARGE LAKES

SOURCE: South Carolina Water Resources Commission, Inventory of Lakes in South Carolina, Ten Acres or More in Surface Area, Report No. 119, Columbia, South Carolina, 1974.

The South Carolina Department of Health and Environmental Control has adopted a water classification-standards system to provide for maintaining and improving the quality of surface waters of the state 9/. (See Appendices E and F.) Appendix G shows major fresh and salt water streams that have been classified according to this system.

Ground Water 10/

Ground water in the basin occurs under both water table and artesian conditions. Ground water occurs under water table conditions in the upper part of the zone of saturation (the zone in which all open spaces in the soil or rock are filled with water) where it is not confined. The water level in a well under water table conditions indicates the upper surface of the zone of saturation. Ground water occurs under artesian conditions when water-bearing parts of the zone of saturation are confined by impermeable layers. The water level in a well under artesian conditions will rise above the top of permeable or water bearing zones.

Ground water generally moves through the geologic formations and aquifers in response to gravity. Ground water moves from areas where levels are highest (recharge areas) toward areas where levels are lowest (areas of discharge).

The direction of ground water flow in the aquifers is at right angles to the contours of equal water level or head. In aquifers under water table conditions, the areas of high and low head generally coincide with topographic highs and lows and movement is away from hills and ridges toward the streams, lakes, swamps, and ocean. In the deeper confined aquifers under artesian conditions, ground water generally moves downward through the aquifer away from the northwestern portion of the basin to the southeast toward the Atlantic Ocean.

In addition to the horizontal or lateral movement of ground water within an aquifer, ground water also moves vertically from one aquifer to another. The vertical movement of ground water is considerably slower than lateral movement within an aquifer because of lower vertical permeability.

Ground water is available for municipal and industrial uses over the greater portion of the basin. Wells constructed in the Tuscaloosa and Santee aquifers are among the highest yielding wells with the best quality water in the state. However, good quality ground water is difficult to obtain in some areas and requires careful management, especially along the coastal and northwestern boundaries.

Along the northwestern boundary of the basin (Area 1 of Figure 2-16) the coastal plain sediments are very thin and terminate on the igneous and metamorphic rocks of the Piedmont. Wells constructed in the coastal plain sediments in Area I are low yielding since the sediment section is thin and the recharge areas are limited. Wells that penetrate the piedmont rocks in Area I are generally low yielding since the igneous rocks in this area have poorly developed joint sets and the metamorphic rocks consist of the Carolina Slate Belt from which it is difficult to obtain water. In Area I, when large quantities of water are required for municipal or industrial use, surface water must be considered. (See Table 2-7.)

In the upper portion (Area II) of the basin, wells are screened

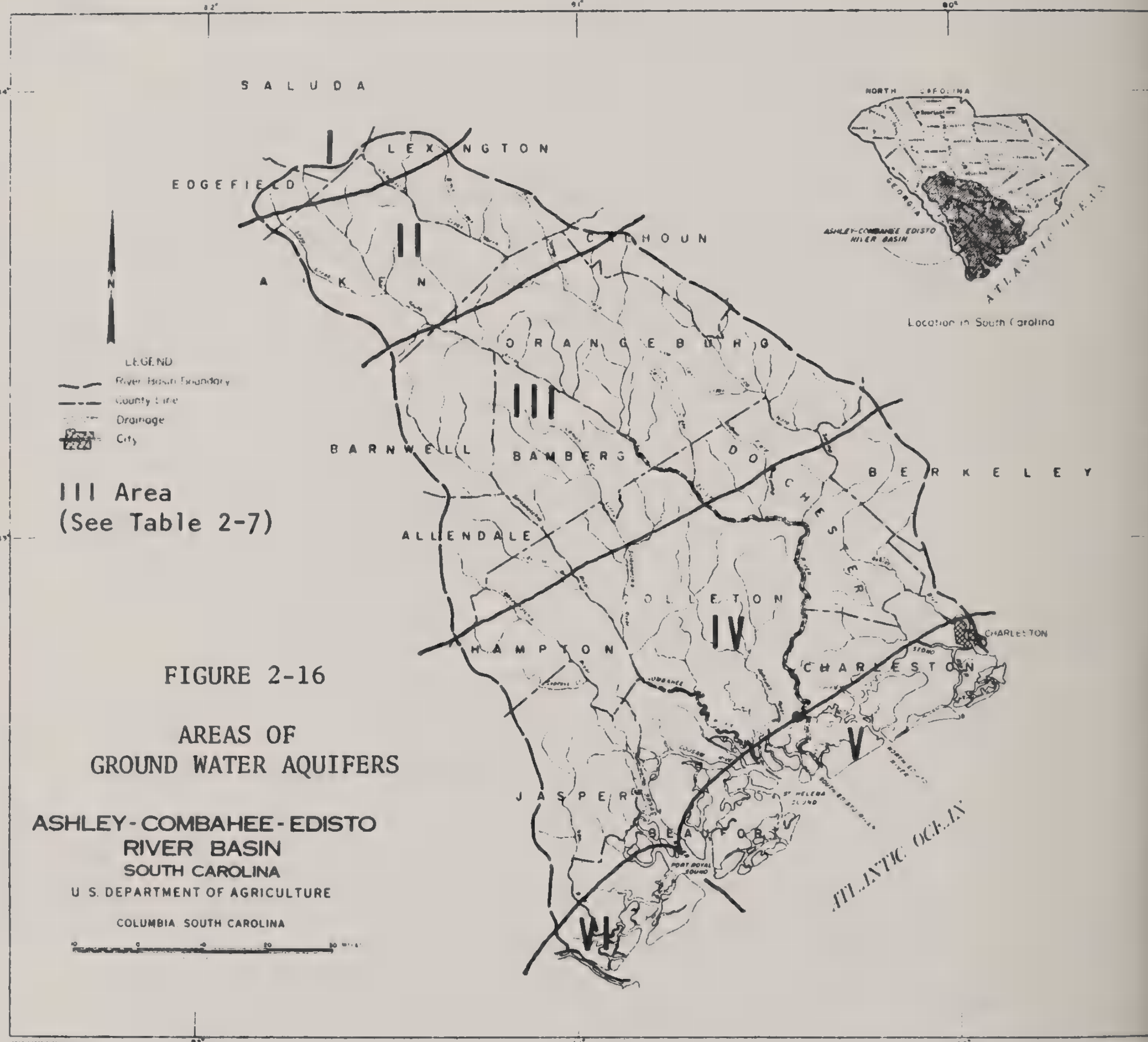


FIGURE 2-16

AREAS OF GROUND WATER AQUIFERS

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
COLUMBIA SOUTH CAROLINA

TABLE 2-7: GROUND WATER DATA

ACE BASIN

Area	Aquifers	Depth 1/	Maximum Yields (gpm)	Characteristic Chemical Constituents	Critical Considerations
I	Tuscaloosa McBean Barnwell	Very shallow	150	Hardness is less than 10 ppm Ph is less than 7 Often iron approximately 1 ppm	Sediment thickness Recharge Topography
II	Tuscaloosa McBean Barnwell	Very shallow	250	Same as above	
III	Tuscaloosa	Shallow	2,000	Same as above	
	Santee Ls	Shallow	300	High hardness Ph is greater than 7	
IV	Pee Dee-Black Creek	Shallow	500	High fluoride	
V	Santee Ls	Very shallow	500	High hardness	Chloride concentration
	Black Creek	Deep	500	Fluoride	
	Tuscaloosa	Very deep	500	Very low hardness	
VI	Santee Ls	Very shallow	3,000	High hardness Ph is greater than 7	Manage pumping and well distribution
	Tuscaloosa	Very deep	500	Very low hardness	

1/ Very shallow - less than 200 feet
Shallow - 200-800 feet
Deep - 800-1,500 feet
Very deep - greater than 1,500 feet

in the sands of the Barnwell, McBean and Tuscaloosa formations. Yields range up to about 500 gallons per minute (gpm).

In the mid-portion (Area III) of the basin, wells screened in the Tuscaloosa aquifer are capable of yields in excess of 3,000 gpm. The transmissivity of the Tuscaloosa ranges from less than 10,000 to 120,000 gallons per day per foot and the storage coefficient is about 0.0004. Water from the Tuscaloosa formation is generally soft, acidic and low in dissolved solids. Water from the Tuscaloosa is corrosive to most metal surfaces because of the very low concentration of dissolved solids and low pH.

In the eastern portion of Area III, wells constructed in the Santee Limestone have yields up to 300 gpm.

In the lower portion of the basin (Area IV) most water is obtained from the Pee Dee and Black Creek formations. Yields range up to 500 gpm and the water is usually high in fluoride.

Along the coast from Port Royal Sound northeastward to Charleston (Area V) potable ground water in large quantities is very expensive to obtain in many areas since very deep wells are required. The water from wells less than 800 feet deep generally contain excessive chloride. Potable ground water is available from wells approximately 2,000 feet deep in quantities of about 500 gpm. The water from the deep zones may however contain excessive fluoride concentrations.

In Area VI, along the coast southwest of Port Royal Sound, the principal water zone is the upper part of the Santee Limestone. This aquifer is exposed to seawater in some parts of the Beaufort River northeast of Port Royal Sound.

In the Savannah, Georgia area, approximately 100 million gallons per day (mgd) of water is being withdrawn from the Ocala Limestone which is in part equivalent to the Santee Limestone in South Carolina. Test wells on Hilton Head and Victoria Bluff have been constructed and have been pumped as high as 2,000 gpm. Management is the most important consideration for water withdrawals from the Ocala Limestone.

Most wells drilled on the islands which make up a large part of Jasper, Beaufort, Colleton and Charleston Counties are subject to salt water intrusion or encroachment. Salt water encroachment takes place by lateral or vertical movement of sea water when a hydraulic gradient is established between the sources of salt water and fresh water in the aquifer. Some aquifers contain salt water which was deposited simultaneously with the sediments and has not been completely flushed by movement of discharging fresh water.

The surficial material is of minor importance as an aquifer. However, domestic yields may be obtained from thick sections of the surficial material. The water obtained from the surficial material is generally soft and may be high in iron, sulfate and nitrate.

Water from some parts of the shallow formations has a disagreeable odor caused by hydrogen sulfide and may also be hard and high in iron content. Shallow water from dune sand along the coast is usually hard and high in chloride and sometimes has an astringent taste. Water in the artesian aquifers near the coast have a higher bicarbonate and fluoride content.

Appendix H shows the chemical and physical analyses of selected public water wells. Appendix I defines terms used in water quality evaluation.

Chemical characteristics of ground water vary with the nature of the formation in which it is stored. Sometimes the water is soft and the mineral content is suitable without treatment for domestic and some industrial purposes, however, quality problems do exist with water from some sources.

Water Consumption

Table 2-8 lists 80 treated water distribution systems in the basin. These systems serve approximately 365,500 people in municipal, community and rural water districts. The 80 systems have a total capacity of 92 mgd, 31 mgd from wells and 61 mgd from surface sources. Their average daily capacity is 58 million gallons. Charleston has the largest system with a total daily capacity of 42 million gallons with an average capacity of 32 million gallons. Figure 2-17 shows the area covered by public water distribution systems.

Thirty-six communities have made applications and are in the process of installing and improving their water systems with financial assistance from the Farmers Home Administration.

Industrial Consumption

Industries consume 14.5 mgd of treated water from municipal water systems. The City of Charleston provided two industries with over 55 mgd of untreated water which is pumped directly out of the Edisto River diversion tunnel.

Many industries own and operate their own water supply systems. Data are not available to determine the quantity of water consumed, but no shortage of ground water for this purpose is anticipated.

Wetlands

An inventory of wetlands was conducted as a part of this study by the Soil Conservation Service. This inventory was made according to Circular 39, U.S. Department of the Interior, Fish and Wildlife Service 11/.

> "The term 'Wetlands", ... refers to lowlands covered with shallow and sometimes temporary or intermittent waters. They are referred to by such names as marshes, swamps, bogs, wet meadows, potholes, sloughs, and river-overflow lands. Shallow lakes and ponds, usually with emergent vegetation as a conspicuous feature, are included in the definition, but the permanent waters of streams, reservoirs, and deep lakes are not included. Neither are water areas that are so temporary as to have little or no effect on the development of moist-soil vegetation. ...
>
> "Most wetlands can be drained or filled to create suitable land for agricultural, industrial, or residential expansion. Others lie in potential

TABLE 2-8: MUNICIPAL AND INDUSTRIAL
WATER SOURCE AND USE

ACE BASIN

County and Community	Water Source	Total Capacity (mgd)*	Average Capacity (mgd)*	People Served (no.)*
Aiken County				
1. Monetta	Wells (3)	.086	-	595
2. New Holland	Well	.110	-	298
3. Wagener	Well	-	.200	1,340
4. Perry	Wells (2)	.17?	.025	458
5. Salley	Wells (2)	.26	.025	637
6. Montmorenci-Couchton	Wells (2)	.372	.038	1,500
7. Ridge Crest	Served by Aiken			
8. Aiken	Shaw Creek Shiloh Springs Wells (2)	5.80	4.00	28,000
Allendale County				
9. Ulmer	Well	.130	.080	308
10. Sycamore	Well	.050	.005	175
11. Fairfax	Well	.187	.150	2,450
12. Industrial Park	Well	.864	.004	10
13. Allendale	Wells (3)	1.65	.325	4,784
Bamberg County				
14. Denmark	Wells (5)	1.44	.76	4,550
15. Bamberg	Wells (5)	1.0	.35	4,571
16. Ehrhardt	Wells (2)	-	.035	805
17. Olar	Wells (2)	.250	.100	1,050
18. Govan	Wells (2)	.06	.005	94
Barnwell County				
19. Williston	Wells (4)	1.98	.700	3,255
20. Blackville	Wells (3)	.936	.300	2,975
21. Hilda	Well	-	-	-
22. Barnwell	Wells (12)	4.75	4.00	4,988
Beaufort County				
23. Beaufort	Savannah River		1.0	14,000
24. Warsaw Eustis Oates		-	-	-
25. Penn Community Services	Well	-	.02	49
26. Fripp Island Public Service District	Wells (3)	.619	-	438
27. Port Royal	Savannah River	-	.400	4,976
28. Forest Beach	Wells (2)	.172	.120	886
29. Sea Pines Plantation Water District	Wells (2)	1.20	.322	2,922
30. Hilton Head Public Service	Wells (5)	-	-	-
31. Chelsea Chesnee	Savannah River	-	.008	200
32. Shell Point		-	-	-
Calhoun County				
33. St. Matthews	Wells (3)	.720	.165	3,765
34. Cameron	Wells (2)	.172	.035	475
Charleston County				
35. North Charleston		-	-	-
36. Charleston	Edisto River Foster Creek Goose Creek	42.0	32.0	175,000
37. St. Andrews		-	-	-
38. Johns Island Dunmovin Subdivision	Well	.100	.021	214
39. Edisto Island	Wells (2)	.274	.045	718
40. Folly Beach	Edisto River	Purchase water from Charleston		
41. James Island	Wells (4)	Purchase water from Charleston		
	Edisto River	-	-	80

TABLE 2-8: MUNICIPAL AND INDUSTRIAL WATER SOURCE AND USE

ACE BASIN

County and Community	Water Source	Total Capacity (mgd)*	Average Capacity (mgd)*	People Served (no.)*
Colleton County				
42. Lodge	Well	.172	.021	220
43. Smoaks	Well	.207	.20	210
44. Williams	Well	.302	.075	231
45. Ruffin	Well	.360	.08	385
46. Walterboro	Wells (12)	3.46	1.30	12,000
Dorchester County				
47. St. George	Wells (3)	.20	.20	2,450
48. Harleyville	Well	-	-	802
49. Ridgeville	Well	-	-	-
50. Summerville	Edisto River	1.0	.85	16,800
Edgefield County				
51. Johnston	First Branch Impoundment	.72	.85	-
Trenton	Wells (3)	.04	.04	-
Hampton County				
52. Brunson	Wells (2)	.086	.065	875
53. Hampton	Wells (4)	1.67	.188	4,300
54. Varnville	Wells (3)	.58	.20	1,555
55. Furman	Well	.04	-	140
56. Scotia	Well	.13	-	105
57. Estill	Wells (4)	.40	-	2,150
58. Luray	Well	.015	-	105
59. Miley Community	Well	.043	.001	122
60. Yemassee	Wells (2)	.28	.06	612
Jasper County				
61. Ridgeland	Wells (3)	.288	.250	2,013
62. Hardeeville	Wells (2)	.180	-	1,886
Lexington County				
63. Batesburg	Light Knot Creek Duncan Creek	2.0	.80	4,900
64. Leesville	Wells (7)	.50	.27	2,485
65. Gilbert Summit	Wells (4)	.130	.05	525
66. Gaston Rural Water District	Wells (3)	.345	-	1,050
67. Pelion	Wells (2)	.086	-	-
68. Swansea	Wells (3)	.302	.075	840
Orangeburg County				
69. Springfield	Wells (2)	.864	.078	1,120
70. Silver Springs Water District	Well	.288	.013	500
71. North	Wells (3)	1.15	.40	-
72. Norway	Wells (3)	.432	.055	871
73. Limestone Rural Water District		-	-	-
74. Branchville	Wells (2)	.110	.05	1,075
75. Bowman	Wells (2)	.432	-	1,046
76. Elloree	Wells (2)	.432	.15	2,000
77. Holly Hill	Wells (3)	.305	.05	1,500
78. Eutawville	Well	.130	.025	455
79. Orangeburg	Edisto River	8.0	4.45	34,745
Saluda County				
80. Ridge Spring	Wells (2)	.120	.045	910

SOURCE: South Carolina Department of Health and Environmental Control, Bureau of Water Hygiene and Special Services, Drinking Water Survey

*Dashes (-) used when data was not available.

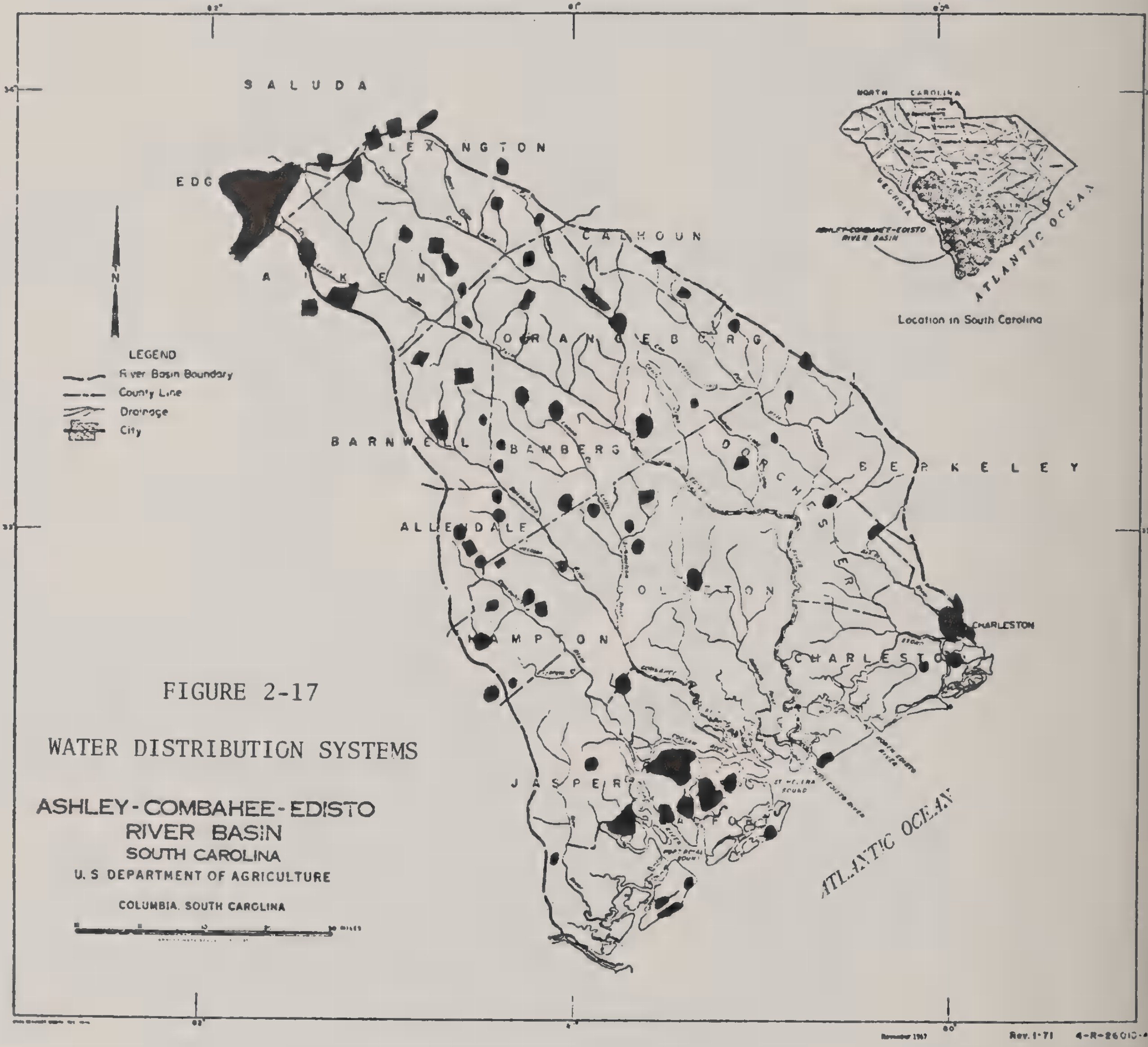


FIGURE 2-17

WATER DISTRIBUTION SYSTEMS

> impoundment sites where permanent deep-water environments can be developed. If either type of project is carried out, however, the food and cover plants required by waterfowl and other wetland wildlife no longer grow in abundance. ..."

Wetland types were established by the U.S. Department of the Interior as a method of classifying wetlands. They are based largely upon landscape position, water, soil and vegetation inter-relationships. Distinguishing features of the wetland types that occur in the basin are shown in Table 2-9.

One general assumption was made to separate the fresh water marsh from salt water marsh. For the purposes of this study, it is assumed that the marsh on the seaward side of the old Seaboard Air Line Railroad bed is considered to be salt and the inland side is considered to be fresh. Sampling by the U.S. Geological Survey has shown the line where salt and fresh waters intersect to vary quite widely on different occasions.

There are about 1.2 million acres of wetlands or about 27 percent of the total basin area. Type 7 (wooded swamp) and Type 1 (overflow areas and wet flats) are the two largest categories by acreage. These are about 394,000 acres and 376,000 acres, respectively. Coastal Saline Area Types 17, 18 and 19 amount to about 293,000 acres or about 25 percent of the wetlands in the basin. Acreages of wetland types by counties in the basin are shown in Table 2-10.

The State of South Carolina is going through the initial stages of preparing tideland legislation to protect its coastal area where a large portion of the wetlands are located.

Fish and Wildlife

Freshwater Fisheries

The freshwater fishery resources of the basin consist exclusively of warm water species. Scattered throughout the basin, a large number of ponds and lakes provide abundant and productive fishing. The total surface area of these ponds and lakes has been estimated at 29,600 acres. Approximately 4,300 ponds are less than 50 acres in size and 65 ponds are greater than 50 acres. These ponds and lakes sustain tremendous fishing pressure and are highly important to the total freshwater fishing picture.

An additional fishery habitat is provided by the numerous streams and rivers in the basin. There are approximately 1,400 miles of streams less than and approximately 50 miles greater than 1/8 mile in width. These figures give some idea of the magnitude of freshwater habitat, but do not give any hint as to their desirability of fishing waters. Bluegill bream, largemouth bass and catfish are the more commonly harvested species in these lakes, ponds, streams and rivers. Other desirable native fish include shellcracker, chain and redfin pickerel, red breast, warmouth and white and black crappie. Exotics, such as white bass have been introduced with some success. Another fish of some importance, not only in its popularity but also in its uniqueness

TABLE 2-9: DISTINGUISHING FEATURES OF WETLAND TYPES

ACE BASIN

Area and Type	Features
INLAND FRESH AREAS	
Type 1	- Overflow areas along streams or in wet flats. Temporarily covered with water at times, principally during the winter. Occurs in forested and open lands.
Type 2	- Low places in open fields, typical of spots where crops have drowned and the farmer has let the areas grow into native wetland plants.
Type 3	- Open, marshy areas that have standing water 6 to 12 inches deep all year. Bulrushes, cattails or pickerel weeds are typical kinds of vegetation.
Type 4	- Similar to Type 3, but water depths up to three feet or more of water during the growing season. Areas have submerged water weeds. This type is rare in the basin.
Type 5	- Areas of fresh water natural ponds. Shallow manmade ponds and reservoirs are included in this type. Water is usually less than 10 feet deep.
Type 6	- Swampy area covered with shrubs and bushes rather than trees.
Type 7	- Wooded swamps where tupelo gum and cypress predominate.
Type 8	- Carolina bays and similar areas.
COASTAL FRESH AREAS	
Type 12	- Fresh water tidal marsh waterlogged during growing season. May be covered at high tide with up to 6 inches of water.
Type 13	- Same as Type 12, except depth of water at high tide up to 3 feet.
COASTAL SALINE AREAS	
Type 17	- The soil is covered by wind tides at irregular intervals during growing season.
Type 18	- The soil is covered at average high tide with 6 inches or more of water during the growing season.
Type 19	- This type includes that portion of saltwater sounds and bays that has been diked to retain a constant cover of saltwater.

SOURCE: U.S. Department of the Interior, Fish and Wildlife Service, Wetlands of the United States, Circular 39, Washington, D.C., Government Printing Office, 1956 (reissued 1971).

TABLE 2-10: WETLAND TYPES 1/

ACE BASIN

County	Inland Fresh Areas								Coastal Fresh Areas		Coastal Saline Areas		
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 12	Type 13	Type 17	Type 18	Type 19
	(acres)												
Aiken		200	50		1,800	700	21,100	700					
Allendale	13,800	300	400		400	400	14,000	700					
Bamberg	45,200	400	400		200	700	23,000	800					
Barnwell	700	400	450		700	300	10,000	900					
Beaufort	28,900	100	200		1,300	100	2,300	100	10,000	19,000	36,000	88,200	170
Berkeley	34,500		50		40	400	13,700	800					
Calhoun	3,000	200	400		300	100	3,500	300					
Charleston	48,700	100	300		1,500	1,300	40,600	900	1,700	2,000	16,100	57,600	370
Colleton	59,700	100	200		2,400	1,900	60,700	800	17,300	21,200	17,000	50,800	30
Dorchester	13,100	500	350		200	2,300	64,700	900	1,200	2,400			
Edgefield			50		100	100	2,000	100					
Hampton	9,600	100	200		1,000	1,300	40,900	700					
Jasper	51,300	100	150		600	1,300	40,200	700	4,000	9,100	800	26,300	
Lexington	2,500		50		1,000	200	6,600						
Orangeburg	64,500	600	600		1,500	1,500	50,800	800					
Saluda				100			550	200					
TOTAL	375,500	3,100	3,850	100	13,040	12,600	394,650	9,400	34,200	53,700	69,900	222,900	570

1/ Wetland types as defined by Circular 39, Wetlands of the United States, U.S. Department of the Interior, Fish and Wildlife Service.

is the striped bass. Shad and sturgeon fisheries are important in the larger rivers.

There are public fishing lakes located near Barnwell and Hampton to satisfy public demand in areas having little other angling opportunities. Other fishing areas include spots along highways where ditches, branches or small tributary streams cross. Many of these are heavily used by fishermen, more because of their accessibility than productivity.

The South Carolina Wildlife and Marine Resources Department operates the Barnwell Fish Hatchery which is used for rearing striped bass fingerlings. The U.S. Fish and Wildlife Service operates the National Fish Hatchery at Orangeburg and produces largemouth bass, bluegill, redear sunfish and channel catfish for ponds and reservoirs in the area.

Saltwater Fisheries

Coastal South Carolina has an historic past as a supplier of shell and finfish harvested from the littoral zone. The commercial harvest of shrimp, oysters and blue crab in South Carolina is big business. Nine species of finfish also support this fishery and include alewines, channel bass, croaker, flounder, whiting, mullet, shad, weakfish and spot. These natural resources support a multi-million dollar industry in South Carolina amounting to more than seven million dollars in 1971.

Hard crabs and oysters represent the largest producers in terms of dollar values. This commercial fisheries industry also provides needed although seasonal employment in the coastal area. Due to the small volume and seasonality of the shrimping industry in South Carolina, investments in processing plants are very limited. However, the possibilities for the crab and oyster industry look promising. Public management in oyster production is a feasible possibility. No other species of finfish or shellfish are of such economic stature as to lend themselves to management practices at this time. At present, the costs of aquacultural operations are prohibitive, but research into improved methods and techniques are being encouraged with some success. Presently there are 14 public oyster beds in the basin. Five are in Charleston County, two in Colleton County, one in Jasper County and six in Beaufort County.

The capability of the saltwater fishery resource to support increased exploitation is unmeasured. The present productive capacity is equal to the volume harvested but it is not known to what extent future productive capacity will exceed the present volume harvested. The Marine Resources Division, South Carolina Wildlife and Marine Resources Department, is studying the estuaries and coastal zone of the basin and will, hopefully answer this and other related questions. The overall economic value of the commercial fishery industry could be substantially increased through development of processing plants and improved marketing. However, consideration must be made during planning to insure that such use is compatible with conservation of estuarine resources. Appendix J is a general discussion of the estuarine resources.

Wildlife Resources

An important aspect of wildlife resources is habitat availability. Wildlife habitat may be classified into two entities, upland and wetland.

Upland wildlife habitat can be further subdivided into cropland, pastureland, woodland and urban areas. In 1970, cropland and pastureland comprised over 1.1 million acres of huntable habitat in the ACE Basin. Recently, with the advent of beef cattle grazing in the lowcountry, more woodland and cropland is being converted to pastureland. Emphasis is being placed on combining small farms and fields into larger ones. This method of farming has reduced edge habitat important to both forest game and farm game. The colorful "patch farms" are being rapidly phased out except in a few areas where sportsmen maintain them principally for quail hunting.

The modern tractor has hastened the conversion to large fields, but modern grain combines waste some of the crop being harvested, making it available for wildlife food. The major grains (corn and soybeans) are good wildlife food but larger fields have reduced the diversification of food, water and cover which are the essential elements for the support of small game species. The game species benefited most by current farming practices is the mourning dove. The larger fields encourage use by doves and the wastage by grain combines provide sufficient food. Also, the increase in farm ponds furnishes water within the daily flight range of doves from almost any spot in the basin. Quails, rabbits, raccoons, squirrels and other small game are found in cropland which either provides adequate cover or has cover nearby. Deer frequent cropland areas for feed and actually cause considerable crop damage in areas where they have reached a high population density. The increase in pastureland has not added much favorable habitat to many wild animal species, although cattle egrets are attracted to the insects stirred up by grazing cattle and wild turkeys use pastures for bugging areas.

Principal forest conditions that influence game habitat are timber types (tree species mixture) and stages of timber rotation. Hunting, fishing and general wildlife enjoyment can be enhanced through manipulation of these conditions. Currently, the basin supports such forest and forest-related game species as quail, gray squirrel, deer and turkey. Early growth of a stand (seedling and sapling stage) provides browse for white tailed deer. Mature stands provide mast (acorns, beechnuts, pecans, etc.) for both deer and squirrel. Wild turkeys use forest conditions for their habitat and prefer mixed hardwoods, small areas of pine and open understory with scattered clearings.

Presently, the South Carolina Wildlife and Marine Resources Department manages two game management areas within the basin. Of the 13,666 acres within the management areas, 5,930 acres are in forest cover. Forest cover in the deep swamps and bottom lands also attracts waterfowl, especially wood ducks that nest in hardwood tree cavities. The U.S. Department of the Interior operates two wildlife refuge areas in Jasper County. The Tybee Bird Refuge with 500 acres is set aside for waterfowl and other birds native to the tidelands. There is a downward trend in acreage of hardwood timber in the basin. The shift from hardwood to pine types will reduce habitat for squirrels, but will increase habitat for turkey, quail and deer.

Land used for expansion of cities, towns, and roads represents lost wildlife habitat. Much of this land is composed of highly productive agricultural areas.

Many species of duck spend the winter months in the wetlands of South Carolina. Fresh water puddle ducks commonly found in the basin are the mallard, black duck, green-winged teal, blue-winged teal, woodduck, widgeon, gadwall, pintail and shoveller. Salt or brackish water diving ducks commonly found in the coastal creeks and bays are the canvasback, redhead, ringneck, greater and lesser scaups, American golden-eye, bluffle-head, hooded merganser, red-breasted merganser and American merganser.

The Clapper rail (marsh hen) is a game bird which inhabits the salt marshes and is found in abundance throughout the coastal region of the basin. Two other rails, the King rail and the Sora rail, inhabit the less saline marshes and are also classified as game birds. These birds are usually not hunted, although a few are taken because they occasionally become interspersed with the Clapper rail.

Many freshwater marshes are the sites of former ricefields of the 19th and early 20th centuries. Many are still used intensively for waterfowl management and provide ideal habitat for many varieties of bird life. One former ricefield being used in this manner is in the Bear Island Game Management Area which is located between the Ashepoo and Edisto Rivers. This area is owned and operated by the South Carolina Wildlife and Marine Resources Department. There are many private plantations and farms which have marsh areas managed in a similar manner. Fresh or brackish water marshes left in a natural state since the days of rice culture are composed of various types of vegetation such as giant cutgrass (Zizaniopsis miliacea), cattail (Typha sp.) and pickerelweed or wampee (Pontederia cordata). While not as valuable for waterfowl, these marshes still provide valuable habitat for the other forms of fish and wildlife especially the American alligator.

Threatened or Endangered Species

There are several threatened or endangered species found within the basin. The following are brief discussions of most of the species either known or suspected to inhabit the basin:

The Atlantic form of the loggerhead sea turtle (Caretta caretta) is becoming quite rare and without protective management may soon face the possibility of becoming an endangered species. Fripp Island Sea Turtle Conservation Center was established in 1971, to provide for the protection of loggerhead turtle nests on Fripp Island and to raise hatchlings until they are old enough to survive at sea.

The population of the Brown Pelican has declined in recent years causing it to be placed on the list of endangered species. Brown Pelicans still exist in fair numbers along the Atlantic Coast.

The Ivory-billed Woodpecker is considered by many to be extinct in South Carolina. Certain areas along the Edisto River could provide the mature hardwood forest habitat required, but habitat

destruction is the main reason for the Ivory-billed Woodpecker's disappearance.

The Red-Cockaded Woodpecker is a permanent resident in the coastal plains section of South Carolina. Its habitat is mature pine woodland. A nesting cavity is excavated in a live pine, usually loblolly with a red heart. Since these trees are usually removed in modern forestry practices, nesting habitat for the Red-Cockaded Woodpecker is reduced.

The American Alligator, a threatened species, is a fairly common resident throughout much of coastal South Carolina. It may be found in any of the river systems of the basin, including pocosins, swamp areas, ponds and lakes.

Other threatened and endangered bird species which may be found within the basin include the Southern Bald Eagle, American Perigrine Falcon, Artic Perigrine Falcon, Eskimo Curlew and Bachman's Warbler.

Recreation Resources

Both the public and private sectors of society have recognized the need for suitable recreational facilities to meet the demands of ever increasing leisure time. In the public sector, the state park system is the most important source of recreation. Local governments, churches, schools, industries and private interest groups provide playgrounds, parks, picnic areas and cultural meeting places. The private sector also provides important facilities such as golf courses, motels, fishing piers and fishing boats. One of the latest trends finds a combination of private and public facilities in the same area.

State Parks 12/

The South Carolina Department of Parks, Recreation and Tourism, through its parks system, operates nine state parks within the basin. Other parks are located just outside the basin but within driving distance of some of the residents. In addition, the state park system will operate a unique natural park at Four Hole Swamp.

The nine state parks contain about 10,000 acres of land and water and have a value of about $46 million. Most of the parks provide camping, picnicking and hiking.

The parks are designated as district, regional or destination based on the area served. District parks include Barnwell, Charles Towne Landing, Colleton Wayside, Rivers Bridge and Old Dorchester.

Regional parks are Aiken, Edisto Beach and Givhans Ferry. Hunting Island is the only destination park in the basin. In addition to the three basic park types, there is included a system of special parks. The special park system includes unique natural area parks, primitive natural area parks, historic parks, cultural parks and wayside parks. Four Hole Swamp is classified as a unique natural park. Table 2-11 is a summary of state parks with their size, type facilities and location. Appendix L is a general description of the state parks.

TABLE 2-11: EXISTING STATE PARKS

ACE BASIN

Name/Type of Park	County	Land (acres)	Water (acres)	Camp Sites (number)	Cottages (number)	Swimming	Boating	Fishing	On Ocean	On Stream	On Lake	Scenic and Nature	Historical
Aiken /Regional	Aiken	1,052	15	25		x	x	x		x	x	x	
Barnwell /District	Barnwell	280	27	25	5	x	x	x			x	x	
Rivers Bridge /District	Bamberg	390		75		x		x		x		x	x
Edisto Beach /Regional	Charleston	1,255		75		x		x	x			x	
Old Dorchester /Historical	Dorchester	97						x		x			x
Charles Towne Landing/District	Charleston	664					x			x		x	x
Givhans Ferry /Regional	Dorchester & Colleton	1,235		25	4	x	x	x		x		x	
Hunting Island /Destination	Beaufort	5,000		100	12	x	x	x	x			x	x
Colleton /District	Colleton	35		25				x		x		x	

NOTE: All parks provide picnic tables, hiking, sanitary facilities and drinking water.

Other Public Areas

Public areas other than state parks include beaches, salt water fishing, some river areas, the Intracoastal Waterway, game management areas, schools and municipal parks.

There are five public beaches along the basin's 100 mile coastline. These are Forest Beach, Folly Field Beach, Folly Beach, Hunting Island State Park and Edisto Beach State Park. Resort beaches are located at Folly Beach, Kiawah island, Seabrook Island, Edisto Beach, Hilton Head Island, Fripp Island and Hunting Island.

An abundance of excellent saltwater fishing is available along the coast. Freshwater fishing and boating opportunities are available at certain locations along the rivers.

About 100 miles of the Atlantic Intracoastal Waterway is in the basin. It is operated by the U.S. Department of the Army, Corps of Engineers. In addition to its use for commercial transportation, the Intracoastal Waterway is used by pleasure craft and numerous recreationists.

Two game management areas have a total of 13,730 huntable acres. These are Bear Island (7,800 acres) and Cypress Creek (5,930 acres). These areas include public land as well as privately owned land under agreement between the state and landowners.

Schools, churches, municipalities, industries and private interest groups provide smaller parks, cultural centers, playgrounds and other recreational opportunities.

Commercial and Clubs

Private enterprise has invested millions of dollars to provide lodging accomodations, restaurants, amusement centers, golf courses, tennis courts, fishing piers and boats and many other recreational facilities. Planned quality residential resorts have developed on several of the sea islands. Private clubs furnish additional recreational facilities for their members.

Golf is a year-round activity and South Carolina has become the golf coast of the eastern United States. The basin boasts a total of 54 courses.

There are 152 public tennis courts and 100 private courts available.

Fishing piers are found at Folly Beach and Edisto Beach. Nine charter fishing boats operate along the coast. There are 20 privately owned and operated marinas and 80 boat ramps in the basin. There are 41 campgrounds with about 3,800 campsites. Twelve riding stables furnish such activities as drag hunting, harness racing, steeplechase, flat racing and polo.

An estimated 138 hunting clubs or businesses are operated in the basin for large animals, as well as small game.

Historic attractions and gardens are central attractions for the Charleston area's tourist business. Middleton Gardens, Magnolia Gardens, Summerville Gardens and Edisto Memorial Gardens attract thousands of visitors each year.

Table 2-12 is a summary of recreational facilities provided by commercial businesses and clubs in the basin. See Appendix L for the capacities of these facilities.

TABLE 2-12: RECREATIONAL FACILITIES
COMMERCIAL AND CLUB

ACE BASIN

Type Site	Planning Region: Lower Savannah	Planning Region: Berkeley-Charleston-Dorchester	Planning Region: Lowcountry	Total
	(Number of Sites)			
Campgrounds	11	18	13	42
Golf Courses	20	13	21	54
Marinas	0	14	6	20
Boat Ramps	7	10	4	21
Hunting	21	42	75	138
Charter Boats	0	6	5	11
Riding Stables	2	7	3	12
Fishing Piers	-	3	1	4

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Outside the Basin

Many major recreational resources lie outside of the basin but within driving distance for weekend trips. Francis Marion National Forest, Clark Hill Reservoir, Lake Greenwood, Lake Murray, Lake Moultrie, Lake Marion, Myrtle Beach and the Columbia and Savannah areas provide recreational opportunities for residents of the basin.

Historic Resources

South Carolina is well endowed with physical evidence of American history of all periods. There are numerous historic homes, churches, special buildings, forts, plantations and sites containing Indian artifacts. Historic and plantation tours are held each year in Charleston, Beaufort and Hilton Head. Appendix N is a list by counties of most of the sites and buildings which are either in or have been nominated for inclusion in the National Register of Historic Places 13/.

Of the basin's many lowcountry plantations, only Middleton, Drayton Hall and Magnolia are open to the public. Yet, many outstanding plantations exist (McLeod, Cuthbert and Stiles Point are located on James Island, Peters Point, Oak Island and Cassina Point, Windsor and Old House are located on Edisto Island), their beauty being hidden from the public eye.

The basin claims a number of the twenty or so shell rings located from the central coast of South Carolina to the central coast of Georgia. These are prehistoric Indian shell middens originally deposited in a ring shape. All are believed to date early in second millenium B.C., and they contain some of the earliest pottery known in North America. Some are included in the National Register of Historic Places.

Very little other information concerning archaeological sites has been made public. According to Dr. Robert L. Stephenson, State Archaeologist, the location of the sites must remain confidential in order to protect them from unauthorized digging by well meaning, but untrained "relic collectors".

Four major trails, important in South Carolina's history, cross through the basin. They are largely undeveloped at this time, except for the George Washington Trail which has been completely marked for motorists.

The Cherokee Path follows the route of the Cherokee Indians' journeys between the mountains and the sea in the Charleston area. The first traders from Charleston into the up-country used this path and settlement(s) later expanded from Charleston along it.

The American Revolution Trail connects the more important of the 137 revolutionary battle sites in the state.

The George Washington Trail follows quite accurately Washington's two tours through South Carolina.

General William Sherman's route through the state is marked by the General Sherman Trail. It passes by nearly all sites of military action in the state.

St. James Episcopal Church, James Island

CHAPTER 3 - HUMAN AND ECONOMIC RESOURCES

Procedures

The economic analyses in this chapter are based upon an area which includes 13 counties. This area is referred to as the Ashley-Combahee-Edisto (ACE) study area and is larger than the actual drainage area of the basin (Figure 3-1). The hydrologic area of the basin comprises four whole counties and 12 partial counties. The economic study area includes 6,012,482 acres, while the actual drainage basin contains 4,475,876 acres.

County line boundaries are used for the economic study area because secondary economic data are not developed on a hydrologic basis. Furthermore, most local planning decisions are based on political rather than hydrologic boundaries. Because the reliability of a projection increases with the size of the base, projections based on the larger economic study area should provide useful guidelines for planning purposes. The economic study area was delineated along South Carolina's multicounty regional planning lines 1/ to provide the greatest value and to aid in analysis of data. All of Planning Regions 5, 9 and 10 are included 2/. Edgefield, Lexington and Saluda Counties, parts of which are within the hydrologic basin, were not included in the economic study area since their respective planning regions lie almost entirely outside the hydrologic area.

1/ In March 1969, the South Carolina Legislature divided the State into 10 planning areas, which are referred to as multicounty planning regions.

2/ Planning Region 5 consists of Aiken, Allendale, Bamberg, Barnwell, Calhoun and Orangeburg Counties. Planning Region 9 consists of Berkeley, Charleston and Dorchester Counties. Planning Region 10 consists of Beaufort, Colleton, Hampton and Jasper Counties.

FIGURE 3-1

ECONOMIC STUDY AREA

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA SOUTH CAROLINA

5 Lower Savannah Region

9 Berkeley-Charleston Region

10 Lowcountry Region

Economic and Resource Development Relationships

The economic development of any region depends largely on the efficient use of its human and natural resource base. This is particularly true in rural areas without developed industrial sectors. The natural resource base of the ACE study area was inventoried in Chapter 2. However, in this chapter the economic importance of natural resources in conjunction with the human resources of the area is examined. An efficient combination of human and natural resources serves as the foundation for future economic growth. This is true whether the resources are used directly as in forestry and agriculture, or indirectly as in tourism and recreation. Although the agricultural and forestry sectors have traditionally been most closely associated with natural resource use, tourism and recreation are making ever increasing demands on the resource base. Tourism and travel is currently the second largest business in South Carolina.

Any comparative advantage that the basin will have in maintaining and expanding its current industrial and tourist based sectors will depend largely on future use of the resource base. Economic information on the close relationship between the resource base and the study area economy should contribute to better decisions concerning future economic well-being.

Population

The study area is characterized by a relatively large rural population, slow industrial growth and a low income level. Historical population data for the United States, the South Atlantic Gulf and the economic base study area of the basin are shown in Table 3-1. The population growth rate in the study area kept pace with national growth rate from 1960 to 1970, but was lower than growth in the South Atlantic Region as a whole.

During the ten year period from 1960 to 1970, the population shifted in composition from 41 percent urban to nearly 52 percent urban. Increased family incomes, better housing, rising standards of living and cultural attractions offered by urban centers attract rural residents particularly youth. They are attracted by the availability of entertainment for their expanding leisure time, by larger and better shopping facilities within a reasonable distance from their homes and by other personal conveniences that are more readily accessible. The extent of this transition is shown in Table 3-2.

These data indicate that recent trends in urban and rural components of the population are in the direction of regional and national trends. Rural population comprises a larger percentage of total population than in most other areas as urbanization of the primarily rural basin has been slower to develop.

An analysis of the age group distribution shown in Table 3-3, indicates that age groups 0-14 and 30-44 are decreasing while the number of people in other age groups is increasing.

TABLE 3-1: TOTAL POPULATION
ACE STUDY AREA AND SELECTED AREAS
1960 - 1970

Area	1960	1970	Percent Increase
Region 5	207,100	214,410	3.5
Region 9	279,000	336,300	20.5
Region 10	101,700	106,500	4.8
Study Area	587,800	657,200	11.8
ACE Basin	408,000	464,000	13.7
South Atlantic Gulf	19,554,000	23,490,000	20.1
United States	177,124,000	203,212,900	14.7

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-2: POPULATION, URBAN AND RURAL COMPONENTS
ACE STUDY AREA
1960 - 1970

Area and Component	1960	1970
Region 5 Total	207,100	214,400
Percent Rural	70.9	66.5
Percent Urban	29.1	33.5
Region 9 Total	279,000	336,300
Percent Rural	39.5	30.9
Percent Urban	60.5	69.1
Region 10 Total	101,700	106,500
Percent Rural	88.5	67.4
Percent Urban	11.5	32.6
Study Area Total	587,800	657,200
Percent Rural	59.0	48.4
Percent Urban	41.0	51.6

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-3: POPULATION, NUMBER AND PERCENT OF AGE GROUPS
ACE STUDY AREA
1960 - 1970

Area	Age Group	1960 Number	1960 Percent	1970 Number	1970 Percent
Region 5	0-14	78,700	38.0	69,000	32.2
	15-29	43,300	20.9	54,100	25.2
	30-44	38,500	18.6	34,500	16.1
	45+	46,600	22.5	56,800	26.5
Region 9	0-14	105,000	37.7	109,600	32.6
	15-29	65,400	23.4	97,200	28.9
	30-44	54,100	19.4	56,800	16.9
	45+	54,500	19.5	72,700	21.6
Region 10	0-14	37,400	36.8	32,900	30.9
	15-29	27,800	27.3	34,100	32.0
	30-44	16,100	15.8	15,000	14.1
	45+	20,400	20.1	24,500	23.0
Study Area	0-14	221,100	37.6	211,500	32.2
	15-29	136,500	23.2	185,400	28.2
	30-44	108,700	18.5	106,300	16.2
	45+	121,500	20.7	154,000	23.4

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1960 and 1970, General Population Characteristics, final report PC(1) B42 South Carolina, 1971.

Migration

Some factors which determine the desirability of living in a locality are employment opportunities, availability of health services, and recreational facilities. The availability of good health services in the study area is far below state and national levels. Employment opportunities in the study area are better than they are in both the state and the nation in several industries. However, in the high wage and fast growth industries, the area lags far behind the nation and these industries offer the best employment opportunities. All of these factors are reflected in the migration trends for the study area.

Migration is primarily responsible for the relatively slow population growth in the ACE study area. Between 1960 and 1970, the area lost an estimated net of 29,890 people due to migration. Table 3-4 shows the migration trends for total and non-white population in the study area and state. The data in this table shows that the non-white population for both study area and state is outmigrating at a faster rate than the total population. Regional outmigration rates are 16 to 23 percent greater for the non-white population. The study area experienced an outmigration of 5.1 percent overall from 1960 to 1970, while 22.3 percent of the non-white population migrated. The non-white migration has occurred in all regions of the study area.

Employment

The development and well-balanced growth of the ACE study area is dependent upon the availability of adequate employment opportunities. New employment opportunities have been concentrated in urban areas. This factor, coupled with a decrease in agricultural employment has resulted in a substantial population loss in rural agriculturally oriented areas. The area's ability to attract nonagricultural employment has and will continue to influence the area's growth.

Total employment in the study area was 168,000 in 1960 and 202,000 in 1970 (Table 3-5), an increase of approximately 20.2 percent. Although the relative increase is consistent with regional and national gains, the unemployment rate was greater than the state average. In 1970, the state unemployment rate was 5.0 compared to 6.1 percent in the study area.

Employment in the study area, South Carolina and the United States is shown by groupings in Table 3-6. Since 1960, increasing proportions of the study area's labor force have been employed in manufacturing and services with the service sector showing the largest absolute increase. Employment in all sectors except agriculture, forestry and fisheries has increased.

Manufacturing employment showed an increase both absolutely and relatively between 1960 and 1970. In 1970, the number employed in manufacturing had increased to an estimated 55,800 or 27.6 percent of all employment in the study area. Most people employed in the manufacturing industry were in textile mill products, chemical and allied products, lumber and wood products, transportation equipment

TABLE 3-4: COMPONENTS OF POPULATION CHANGE BY RACE
ACE STUDY AREA AND SOUTH CAROLINA
1960 - 1970

Area	Population		Change		Components of Change			
							Net Migration	
	1960	1970	Number	Percent	Births	Deaths	Number	Percent
Region 5	207,100	214,400	+ 7,300	+ 3.5	48,830	19,390	- 22,140	-10.7
Non-white	94,700	88,500	- 6,200	- 6.5	25,400	9,440	- 22,160	-23.3
Region 9	279,000	336,300	+ 57,300	+20.5	81,750	23,910	- 540	- 0.2
Non-white	109,800	107,900	- 1,900	- 1.7	32,080	11,150	- 22,830	-20.8
Region 10	101,700	106,500	+ 4,800	+ 4.8	20,850	8,840	- 7,210	- 7.0
Non-white	48,300	44,900	- 3,400	- 7.2	12,740	4,830	- 11,310	-23.5
ACE Study Area	587,800	657,200	+ 69,400	+11.8	151,430	52,140	- 29,890	- 5.1
Non-white	252,800	241,300	- 11,500	- 4.5	70,220	25,420	- 56,300	-22.3
South Carolina	2,382,600	2,590,500	+207,900	+ 8.7	573,460	216,130	-149,430	- 6.3
Non-white	831,600	796,100	- 35,500	- 4.3	236,440	84,080	-187,860	-22.5

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population and Housing, final report SC PHC(2)-42, 1971.

TABLE 3-5: EMPLOYMENT
ACE STUDY AREA AND SELECTED AREAS
1960 - 1970

Area	1960	1970	Percent Increase
	(Thousands of Workers)		
Study Area	168	202	20.2
South Carolina	803	954	18.8
South Atlantic Gulf	7,210	9,106	26.3
United States	66,372	76,553	15.3

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-6: EMPLOYMENT BY MAJOR GROUPINGS, NUMBER AND PERCENT
ACE STUDY AREA AND SELECTED AREAS
1960 - 1970

Employment	Region 5		Region 9		Region 10		Study Area		South Carolina		United States	
	1960	1970	1960	1970	1960	1970	1960	1970	1960	1970	1960	1970
Agriculture, Forestry and Fisheries												
Number	11,821	4,797	4,801	2,188	4,697	2,326	21,319	6.985	95,636	39,788	4,349,884	2,840,488
Percent	18.2	6.7	6.0	2.1	18.7	8.5	12.7	3.5	11.9	4.2	6.8	3.7
Contract Construction												
Number	4,376	5,499	5,960	7,830	2,126	2,851	12,462	16,180	51,784	70,252	3,815,937	4,572,235
Percent	6.9	7.7	7.5	7.6	8.5	10.4	7.4	8.0	6.5	7.4	6.0	6.0
Manufacturing												
Number	18,767	25,141	21,450	24,334	4,868	6,341	45,085	55,816	265,301	345,423	18,382,448	19,837,208
Percent	29.6	35.0	26.9	23.6	19.3	23.2	26.8	27.6	33.1	36.3	28.7	26.1
Transportation, Communication, and Utilities												
Number	2,214	3,182	5,297	6,829	965	1,557	8,476	11,568	32,484	46,271	4,458,141	5,186,101
Percent	3.5	4.4	6.6	6.6	3.8	5.7	5.0	5.7	4.1	4.9	7.0	6.8
Wholesale and Retail Trade												
Number	9,953	11,596	15,923	19,565	4,568	4,999	30,444	36,160	133,854	159,306	12,661,997	15,372,880
Percent	15.9	16.2	19.9	19.0	18.2	18.3	18.1	17.9	16.7	16.7	19.8	20.3
Finance, Insurance and Real Estate												
Number	1,547	2,115	2,125	4,055	612	876	4,284	7,044	22,412	31,569	2,694,630	3,838,387
Percent	2.4	2.9	3.4	3.9	2.4	3.2	2.6	3.5	2.8	3.3	4.2	5.1
Services												
Number	13,154	17,343	19,386	29,514	5,716	6,163	38,526	53,020	175,213	223,425	14,419,308	20,073,860
Percent	21.0	24.1	24.3	28.6	22.7	22.5	22.8	26.3	21.8	23.4	22.5	26.4
Government												
Number	1,562	2,145	4,396	8,796	1,615	2,262	7,483	13,203	25,634	36,952	3,202,890	4,201,682
Percent	2.5	3.0	5.4	8.5	6.4	8.3	4.5	6.5	3.2	3.7	5.0	5.5

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

and other miscellaneous manufacturing. The service industry with an employment of 53,000 is the second most important source of work in the area. Despite the earlier dominance of the textile, lumber and wood products industries, diversification of manufacturing has occurred. There have been substantial increases in the food and kindred products industry and printing and publishing. Apparel manufacturing has also been growing rapidly. The largest and most rapid gains, however, have been in the chemical and allied products industry, which employs almost four and one-half times as many people as it did in 1960.

Employment in Fast Growth and High Wage Industries

Two important indicators of an area's economic vitality are amount of employment in fast growth industries and proportion of employment in high wage industries. A comparison of these two indicators to national averages serves to give an overview of the general employment viability of the study area. A fast growth industry is one developing faster than the national average for all industries. Table 3-7 reveals that the study area employment in national fast growth industries was below the United States average, although above the South Carolina average. In 1970, employment in fast growth industries averaged 60.1 percent for the United States, but only 54.0 percent for the study area and 43.9 percent for South Carolina. There were only six study area industries with a higher percent than the national average - construction, utility and sanitary services, other personal services, all education services, welfare, religious and nonprofit and public administration. This would indicate that employment growth in most study area industries generally lags behind the national employment growth rate for that industry.

The amount of employment in high wage industries may serve as an indication of the general industrial wage level of an area. If employment in high wage industries is above the national average, the area may be considered to have a high wage level. Employment in high wage industries in the study area is slightly below the national average. (See Table 3-8.) In 1970, employment in industries which are considered high wage nationally accounted for 37.9 percent of all employment in the study area. This was below the national average of 42.5 percent, but above the South Carolina average of only 27.0 percent.

Location Quotients

Location quotients are an indication of an industry's importance in an area compared to the rest of the nation. For example: In the study area employment in services was 25.2 percent of total employment in 1970 - in the United States it was 26.4 percent. Thus, the location quotient or the percentage employed in the basin divided by the national percentage is 0.954. If an industry has a location quotient greater than 1.00, the industry is more important regionally than nationally. In order to determine the importance of various industries to the study area, location quotients were calculated for industries composing 10 percent or more of all manufacturing. Employment in four manufacturing industries is proportionately higher in the study area than in the United States (Table 3-9). Textiles and fabricated products are by

TABLE 3-7: PERCENT OF CIVILIAN EMPLOYMENT FAST GROWTH INDUSTRIES
ACE STUDY AREA AND SELECTED AREAS
1970

Industry	Region 5	Region 9	Region 10	Study Area	South Carolina	United States
Construction	7.4	7.6	10.0	8.1	2.2	6.0
Machinery manufacturing, except electrical	1.2	0.6	0.3	0.8	1.6	2.6
Electrical machinery equipment and supplies	1.1	0.6	0.3	0.7	1.4	2.5
Other durable goods	3.5	1.9	1.0	2.4	2.2	2.7
Other nondurable goods	2.4	3.2	4.5	3.0	3.3	3.1
Trucking service and warehousing	0.9	1.1	0.7	1.0	1.0	1.4
Other transportation	0.6	1.8	1.3	1.2	0.7	1.5
Communications	1.1	1.2	0.8	1.2	1.0	1.4
Utilities and sanitary services	1.5	2.1	1.6	1.8	1.6	1.7
Wholesale trade	2.6	3.5	2.4	3.1	3.1	4.1
Eating and drinking places	1.6	2.4	2.2	2.0	1.9	3.0
Business and repair services	1.7	2.5	1.9	2.1	2.0	3.1
Other personal services	3.3	3.5	5.7	3.7	3.2	3.2
Entertainment and recreational services	0.5	0.6	0.6	0.6	0.5	0.8
Hospitals and health services	3.1	5.8	3.4	4.3	4.0	5.5
All educational services	7.7	9.2	7.4	8.2	7.3	8.0
Welfare, religious and nonprofit	1.1	2.6	1.4	1.8	1.3	1.5
Legal, engineering and miscellaneous professional services	1.5	1.9	1.7	1.7	1.7	2.6
Public administration	3.0	8.5	7.7	6.3	3.9	5.5
TOTAL FAST GROWTH	45.7	60.4	55.0	54.0	43.9	60.1

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-8: PERCENT OF CIVILIAN EMPLOYMENT IN HIGH WAGE INDUSTRIES
ACE STUDY AREA AND SELECTED AREAS
1970

Industry	Region 5	Region 9	Region 10	Study Area	South Carolina	United States
Mining	0.4	0.1	0.0	0.2	0.2	0.8
Construction	7.4	7.6	10.1	8.5	2.2	6.0
Metal industries	1.6	1.0	0.9	1.3	1.2	3.5
Machinery, except electrical	1.2	0.6	0.3	0.9	1.6	2.6
Electrical machinery, equipment	1.1	0.6	0.3	0.9	1.4	2.5
Transportation equipment	0.4	9.9	1.5	4.3	1.5	2.8
Food and kindred products	1.1	0.7	1.2	1.0	1.0	1.8
Printing and publishing	0.4	0.6	0.3	0.5	0.6	1.6
Chemicals and allied products	6.0	0.7	0.6	2.6	2.3	1.3
Railroad and railway express	0.3	0.4	0.7	0.4	0.5	0.8
Trucking service and warehousing	0.7	1.1	0.9	1.0	1.0	1.4
Other transportation	0.6	1.8	1.3	1.3	0.7	1.5
Communications	1.1	1.2	0.8	1.1	1.0	1.4
Utilities and sanitary services	1.5	2.1	1.6	1.7	1.6	1.7
Wholesale trade	2.6	3.5	2.4	2.8	3.0	4.1
Finance, insurance and real estate	2.9	3.9	3.0	3.3	3.3	3.3
Public administration	3.0	8.5	7.7	6.3	3.9	5.5
TOTAL	32.4	44.3	33.3	37.9	27.0	42.5

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-9: LOCATION QUOTIENTS, TWO-DIGIT MANUFACTURING
ACE STUDY AREA AND SELECTED AREAS
1970

Manufacturing group	Regional Importance Compared to United States			Importance of Study Area to	
	Region 5	Region 9	Region 10	South Carolina	United States
Furniture, lumber and wood products	1.43	1.30	3.40	1.36	1.47
Metal industry	0.33	0.31	0.30	1.41	0.33
Machinery, except electrical	0.34	2.46	0.11	0.72	0.31
Electrical machinery, equipment and supplies	0.32	0.24	0.12	0.82	0.32
Transportation equipment	0.11	3.90	0.62	3.67	1.43
Other durable goods	0.95	0.75	0.42	1.42	0.85
Food and kindred products	0.43	0.42	0.79	1.24	0.51
Textiles and fabricated products	3.93	1.14	3.19	0.62	3.00
Printing, publishing and allied products	0.19	0.42	0.25	1.24	0.35
Chemicals and allied products	3.38	0.62	0.52	1.47	1.82
Other nondurable products	0.57	1.13	1.77	1.11	0.86

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

far the most important with a location quotient of 3.00. Other manufacturing industries with a location quotient greater than 1.00 are - chemical and allied industries (1.82), furniture, lumber and wood products (1.47) and transportation equipment (1.43).

Continued diversification throughout the area would further benefit area residents. By providing a wide range of employment opportunities, migration could be reduced, and perhaps even reversed. Investments in human resources would pay a dividend rather than be lost. Income levels would rise with more technically oriented industries and the demand for goods and services would be stimulated. The economy would tend to stabilize since it would be protected from sudden and severe fluctuations to which the textile and apparel industries are especially sensitive.

The desired diversification, however, requires a well educated labor force. Modern industry requires workers with high levels of skill and training. Continued emphasis on obtaining a high school diploma and technical or vocational training will greatly aid in raising educational levels.

All efforts will be futile, however, unless new industry is simultaneously attracted. Without adequate increases in employment opportunities, skilled young people will migrate to other areas where employment opportunities exist.

Shift-Share Analysis

Factors underlying study area employment trends may be identified by using a technique called shift-share analysis. This technique, shown in Table 3-10, separates an area's employment growth into three components and attempts to measure the contribution of each.

The first component of employment growth is termed the national effect. This component measures the amount which each study area industry would have grown between 1960 and 1970, if the industry had grown at the national growth rate for all industries which was 13.4 percent. For example, study area construction employment in 1960 was 12,460 people. This number if increased by 13.4 percent would show a net increase of 2,293 jobs and is shown in Table 3-10 as the national growth effect. The national growth effect is isolated in order to focus on the two remaining components which together account for the regional shifts in employment. The second component of the shift-share technique is known as industrial mix. This component identifies whether employment in a specific industry is growing faster or slower than the national average for all employment. A negative number indicates an industry which is considered a slow growth area nationally and its effect on overall growth is negative. The third component is termed the regional or study area-share effect. This is computed by applying the difference between the percentage change in employment in an industry in the study area and the percentage change in employment in the same industry nationally. An industry that is growing faster in the study area than in the nation as a whole, will add to the area's overall growth relative to that of the nation. On the average, the national growth effect accounted for 78 percent of study area employment growth from 1960 to 1970, with the regional share effect responsible for almost all the remaining growth. The data indicate that a majority of the study area industries enjoyed

TABLE 3-10: SHIFT-SHARE ANALYSIS
ACE STUDY AREA
1960 - 1970

Industry	Civilian Employment			National Growth	Industry Mix	Regional Share
	1960	1970	Change 1970-1960			
Agriculture, forestry and fisheries	21,320	6,990	-14,330	3,920	-15,540	-2,710
Construction	12,460	16,180	+ 3,720	2,290	+ 170	-1,260
Manufacturing	45,090	55,820	+10,730	8,300	- 2,330	-4,760
Transportation, utilities and communications	8,480	11,570	+ 3,090	1,560	- 180	+1,710
Wholesale and retail trade	30,440	36,170	+ 5,730	5,600	+ 3,630	-3,500
Finance, insurance and real estate	4,280	7,040	+ 2,760	790	- 1,030	+3,000
Services	38,260	53,020	+14,760	7,040	+11,400	-3,680
Government	7,480	13,200	+ 5,720	1,380	+ 950	+3,990
Total civilian employment	167,810	199,990	+32,180	30,880	+ 960	+ 340

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

a faster employment growth rate than they did in the nation as a whole. It should be noted, however, that employment increases in the study area were from a relatively low base. Therefore, the seeming prosperity indicated by the shift-share technique may not be as great as would appear.

Income

Income is a major factor in determining the standard of living of inhabitants and the types and level of services available to them. It similarly reflects the general health of the economy and its potential for growth.

Median family income in the study area was almost the same as that of the state in both 1960 and 1970 (Table 3-11). However, in both years this was only 78 percent of the United States' median.

Although study area income increased at the same rate as national family median income (approximately 97 percent during the decade) there was still a large difference in actual dollar income levels in 1970. In 1960, the study area income averaged $1,111 below the national average, by 1970 the difference had increased to $2,280. Thus, even though family incomes are increasing, the gap between national and study area incomes is widening.

Per capita income is often used to describe personal economic well-being, which indicates the average monetary income level for each person. Per capita income in the study area was well below the state in both 1960 and 1970 and far below the national average (Table 3-12). In 1960, study area per capita income was $1,529 compared to the state's $2,068 and a national average of $3,351. Although the study area enjoyed a faster rate of increase from 1960 to 1970 than did the state and nation, per capita income in the study area was still only $2,441 in 1970. How much of the increase in per capita incomes was real and how much apparent, resulting from outmigration of the poorest segment of the population, is unknown. However, per capita income in the study area increased from 45.6 percent of the United States' average in 1960 to 71.8 percent in 1970.

Low Income Levels

To further describe the general economic level of study area inhabitants, data were compiled on the number of familes below the 1970 Census of Population low income level (Table 3-13).

Over 20 percent of the families in each of the three planning regions had incomes below the low income level 3/. For the entire

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3/ For this area, the low income level was computed to be $3,450. The computation is based on a family of four headed by a male. For an urban family the low income level was $3,745 and for a rural family was $3,197. In the study area, 46 percent of the 1970 population was urban and 54 percent rural.

TABLE 3-11: MEDIAN FAMILY INCOME AND NUMBER OF FAMILIES
ACE STUDY AREA AND SELECTED AREAS
1960 - 1970

Area	1960 Number of Families (Thousands)	1960 Median Family Income (Dollars) 1/	1960 Percent of U.S. Median (Percent)	1970 Number of Families (Thousands)	1970 Median Family Income (Dollars) 2/	1970 Percent of U.S. Median (Percent)
Region 5	46.6	3,862	74	51.8	7,879	77
Region 9	61.6	4,619	88	77.8	8,502	83
Region 10	20.7	3,160	61	23.4	6,615	64
ACE Study Area	128.9	4,111	79	153.0	8,002	79
South Carolina	603.6	4,165	80	628.7	8,307	81
United States	45,128.0	5,222		51,168.5	10,282	

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

1/ 1960 dollars.
2/ 1970 dollars.

TABLE 3-12: PER CAPITA INCOME
ACE STUDY AREA AND SELECTED AREAS
1960 - 1970

Area	1960		1970	
	Per Capita Income (Dollars) 1/	Percent of United States (Percent)	Per Capita Income (Dollars) 2/	Percent of United States (Percent)
Region 5	1,425	42.5	2,309	67.9
Region 9	1,716	51.2	2,620	77.1
Region 10	1,229	36.7	2,139	62.9
ACE Study Area	1,529	45.6	2,441	71.8
South Carolina	2,068	61.7	2,510	73.8
United States	3,351	100.0	3,400	100.0

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

1/ 1960 dollars.
2/ 1970 dollars.

study area, 34,898 families (22.8 percent) were below the low income level in 1970.

Food Stamp Program

Another indication of the economic well-being of study area residents is the number of families participating in the Food Stamp Program. Low income is a major qualification requirement for this program.

The proportion of families in the program in January 1974, was larger than for the state as a whole (Table 3-14) - 20.4 percent of all families in the study area compared to the state average of 16.4 percent.

Medical and Health Facilities

Availability of health and life sustaining facilities is a measure of the general well-being of a population. On a per person basis, health facilities in the study area are far below the national average. The number of people per doctor in 1967 averaged 855 in the study area and for the state averaged 1,101 people per doctor (Table 3-15). This compared even less favorably in number of hospital beds (Table 3-16). In the economic study area in 1969, there was only one hospital bed per 275 people compared to the state average of one bed per 284 people and the United State's average of one bed per 205 people. Federal hospitals were not included since they are not readily available to the general public. There was also a severe shortage of dentists in the study area. The average number of people per dentist was 4,545 for the study area, 3,945 for the state and 1,837 for the nation in 1967.

Housing

Residents of the study area generally live in housing that is more crowded, less valuable and generally less sanitary than housing in the state as a whole (Table 3-17). In 1970, persons per unit of housing averaged 3.6 in the study area compared with a statewide average of 3.5.

Median value of single family, owner occupied housing units was $12,396 or $957 less than the state average. The median gross rental value of renter occupied units at $74 per month was also less than the $77 per month average statewide. Sanitary conditions of study area housing, indicated by presence of plumbing facilities was well below the state level. In 1970, all or some plumbing facilities were lacking in 25.6 percent of the area's housing units, while the state average was only 16.8 percent. Of all housing units in the study area, 13.9 percent had more than one person per room and only 48.4 percent had all plumbing facilities.

TABLE 3-13: FAMILIES BELOW LOW INCOME LEVEL
ACE STUDY AREA
1970

Area	Total Number of Families	Number of Families Below Low Income Level	Percent of Families Below Low Income Level
Region 5	51,760	11,980	23.1
Region 9	77,799	16,155	20.8
Region 10	23,416	6,763	28.9
ACE Study Area	152,975	34,898	22.8
South Carolina	628,689	120,080	19.1

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

TABLE 3-14: FAMILIES PARTICIPATING IN THE FOOD STAMP PROGRAM
ACE STUDY AREA
JANUARY 1974

Area	Total Number of Families	Number of Families in Food Stamp Program	Percent of Families in Food Stamp Program
Region 5	51,760	13,941	26.9
Region 9	77,799	12,042	15.5
Region 10	23,416	5,274	22.5
ACE Study Area	152,975	31,257	20.4
South Carolina	628,689	102,897	16.4

SOURCE: South Carolina Department of Social Services, Statistical Report, Volume 37, No. 7, January 1974, Columbia, South Carolina, 1974.

TABLE 3-15: SELECTED HEALTH PERSONNEL
ACE STUDY AREA AND SELECTED AREAS
1966 - 1967

Area	Total Resident Population July 1, 1966	Number of Health Persons						
		Per 100 Population (1966)				Per 1,000 Population (1967)		
		Pharmacists		Registered Nurses		Dentists	Physicians (M.D.s)	
		Total	Active	Total	Active	Total	Total	Active
Region 5	215,600	0.49	0.45	2.99	2.16	0.20	0.64	0.59
Region 9	343,500	0.48	0.40	3.71	2.42	0.25	1.70	1.63
Region 10	106,200	0.31	0.27	2.09	1.13	0.11	0.90	0.83
ACE Study Area	665,300	0.45	0.39	3.21	2.12	0.22	1.22	1.17
South Carolina	2,607,400	0.45	0.42	2.98	2.20	0.25	0.95	0.91
United States	195,933,100	0.67	0.60	4.63	3.13	0.54	1.54	1.47

SOURCE: U.S. Department of Health, Education and Welfare, Public Health Service, Health Manpower, A County and Metropolitan Area Data Book, 1973.

Category	Region 5	Region 9	Region 10	ACE Study Area	South Carolina
1969 Population - All Ages (in thousands)	214	336	106	656	2,590
State and local government					
Hospitals	5	4	3	12	33
Beds per 1,000 population	2.57	2.00	2.67	2.29	1.69
Admissions	20,158	17,299	11,678	49,135	144,529
Average daily census	418	465	236	1,119	3,416
Federal government					
Hospitals	-	2	1	3	7
Beds per 1,000 population	-	2.42	3.00	1.72	0.87
Admissions	-	13,801	4,131	17,932	44,457
Average daily census	-	724	178	902	1,797
Proprietary					
Hospitals	-	1	-	1	10
Beds per 1,000 population	-	0.02	-	0.01	0.09
Admissions	-	274	-	274	9,195
Average daily census	-	4	-	4	153
Nonprofit					
Hospitals	-	4	-	4	31
Beds per 1,000 population	-	1.66	-	0.85	1.70
Admissions	-	22,484	-	22,484	172,590
Average daily census	-	455	-	455	3,606
Total hospitals 1/	5	9	3	17	74
Total beds per 1,000 population 1/	2.57	4.60	2.67	3.63	3.50

SOURCE: U.S. Department of Health, Education and Welfare, Public Health Service, Hospitals, A County and Metropolitan Area Data Book, 1973.

1/ Not including federal hospitals.

TABLE 3-17: HOUSING, OCCUPIED UNITS
ACE STUDY AREA AND STATE
1970

Category	Region 5	Region 9	Region 10	ACE Study Area	South Carolina
Total number of units	60,657	91,419	27,564	179,640	734,398
Average persons per unit	3.8	3.7	3.7	3.6	3.5
Owner occupied (percent)	64.4	68.3	65.8	66.7	66.1
Median value: owner occupied, single family	$10,934	$15,175	$10,316	$12,396	$13,353
Median gross rental per month, renter occupied	$ 58	$ 100	$ 68	$ 74	$ 77
Lacking some or all plumbing (percent)	31.0	16.5	30.4	25.6	16.8
With 1.01 or more persons per room					
Total (percent)	15.3	12.2	13.5	13.9	12.0
With all plumbing (percent)	39.2	59.2	46.2	48.4	57.1
Moved into unit during 1965-70 (percent)	43.1	55.3	42.9	46.6	48.7

SOURCE: U.S. Department of Commerce, Bureau of Census, County and City Data Book, 1972 (A Statistical Abstract Supplement), 1973.

Education

In the study area, only 36 percent of the population over 25 years of age had completed high school in 1960 (Table 3-18), and only seven percent had received a college education. By 1970, 47 percent of the population over age 25 had finished high school and nine percent had completed college. Although the education picture is improving, a strong effort will be required in order to attain national levels.

Transportation

Transportation by road or rail is the most prevalent means of moving people and goods. Area roads are primarily public and paved with an all-weather surface. There are 1,200 miles of federal interstate highways and U.S. routes crossing the study area (Figure 3-2).

State roads (estimated to be in excess of 12,000 miles) are primarily of the farm to market type and have the greatest impact on area development. County roads are of less importance. Most extend into remote areas with a minimum of use and are upgraded as funds become available. They are then granted to the state and become a part of the state road system. Many of the 800 miles of county roads are unpaved.

Railroads still play an important part in the transporting of raw and finished products into and out of the area. The basin is served by two major rail lines (the Seaboard Coast Line and the Southern Railway) and the Hampton-Branchville Railroad which is privately owned.

Two types of water transportation are available. One comprises the ocean-going vessels that dock at Charleston, Beaufort or Savannah to load and unload goods and materials. The second is the commercial and pleasure traffic that moves through 100 miles of the Intracoastal Waterway. The waterway extends from Charleston to a point near Savannah, Georgia. The major part of the route is through improved natural channels connected by short segments of man-made canals.

Commercial air service to the basin is provided by three major air lines serving Charleston and Columbia, South Carolina and Savannah, Georgia. There are 15 small municipal airports and two active military air bases located throughout the study area.

TABLE 3-18: EDUCATION CHARACTERISTICS OF PERSONS 25 YEARS OR OLDER
ACE STUDY AREA
1960 - 1970

Category	Region 5	Region 9	Region 10	ACE Study Area
	(Percent)			
No School				
1960	5.2	4.1	7.8	5.1
1970	3.3	2.3	4.3	2.9
Elementary - 8 years				
1960	48.1	42.4	48.3	45.4
1970	36.7	27.6	36.9	32.1
High School				
1960	32.4	39.6	32.5	35.8
1970	44.0	50.5	43.5	46.8
Some College				
1960	6.5	6.8	5.6	6.5
1970	8.3	9.6	7.3	8.8
College or More				
1960	7.8	7.2	5.8	7.2
1970	9.0	9.9	8.1	9.3
	(Number)			
Total Population - 25 years or older				
1960	96,840	126,676	42,414	265,930
1970	106,245	154,759	45,956	306,960
Median Years of School				
1960	8.7	9.6	8.4	9.1
1970	10.3	11.7	10.3	11.0

SOURCE: U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

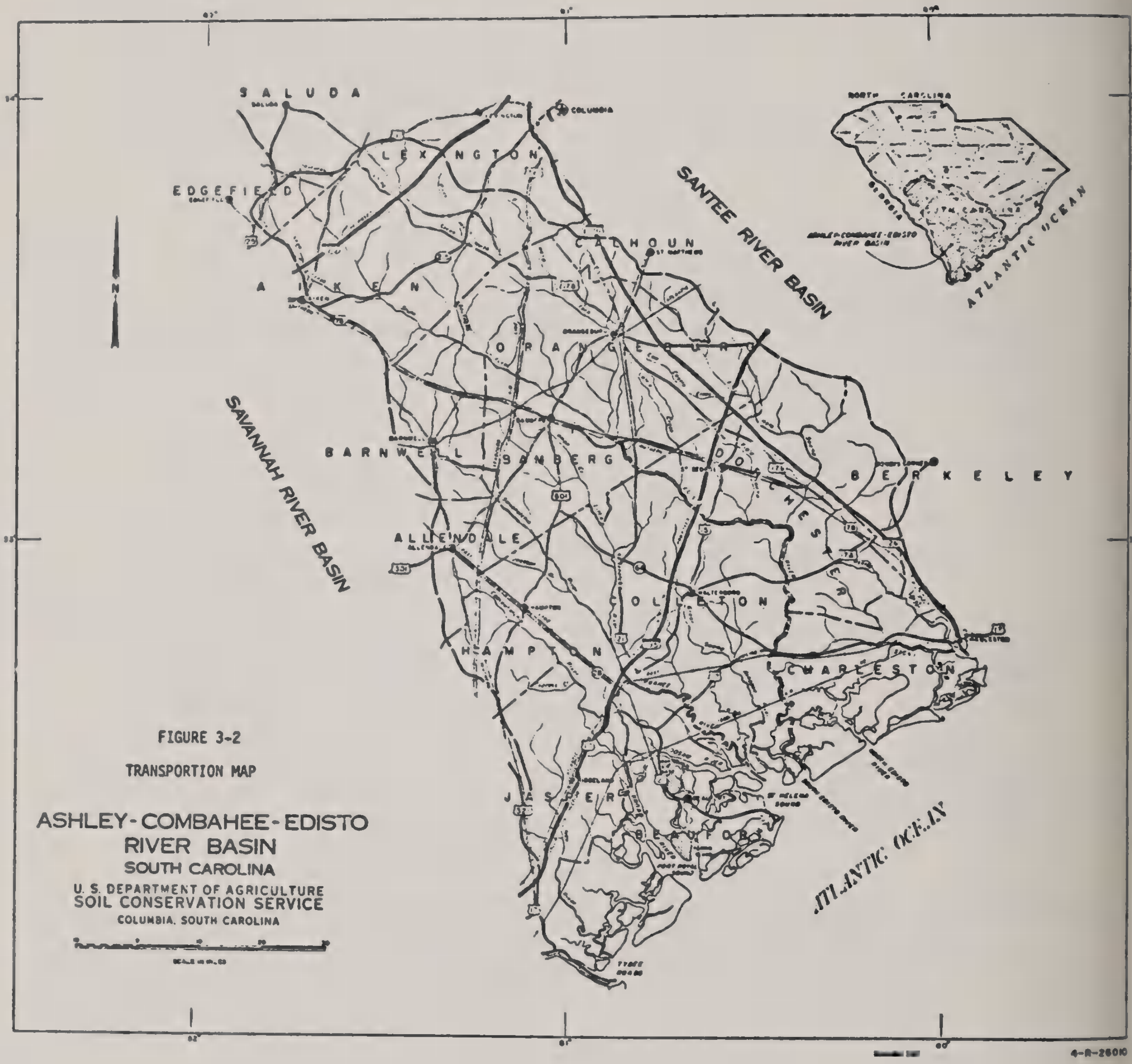

FIGURE 3-2

TRANSPORTION MAP

ASHLEY-COMBAHEE-EDISTO
RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
COLUMBIA, SOUTH CAROLINA

Forest resources of the ACE Basin assume a major role in the area's economy. This role is identified through the supply of raw wood used by the forest industry, through forest habitat that supports many forms of flora and fauna, through the yield of clear, clean water for human and industrial consumption and through the total forest environment in which visitors find numerous recreational opportunities.

Production and Harvest

Wood fiber production makes a significant contribution to the basin's economy. A growing stock volume of 2.7 billion cubic feet (Table 3-19) provides the raw material from which 96.9 million cubic feet are harvested annually 4/. This annual harvest with a stumpage value of 20.6 million dollars (1972 market conditions) is processed by wood product mills scattered throughout the area and other parts of the state.

The annual timber growth in the area produces 132.4 million cubic feet of wood fiber. This current yield, 50 cubic feet per acre per year, is below the area's growth potential. Under improved management commercial forest lands can reach a growth rate of 75 cubic feet per acre per year. See Figure 3-3 for comparison of growth and drain.

The basin's sawtimber volume currently averages 2,998 board feet per acre; the state-wide average is 2,821 board feet. Improved management can utilize more of the timber growing potential to yield an average of 4,500 board feet per acre -- a 50 percent increase.

Difference in management is clearly seen in comparing growth rates between ownership groups. Forest industry, recognized for its higher standards of management, has 38 percent of its timber holdings in stands that yield 85 cubic feet of growth per acre per year. In contrast, non-industrial private ownerships have only 20 percent of their acreage in this growth class. Other comparisons, such as per acre stand volume, also reflect levels of management among various ownership groups. See Figure 3-4 for net annual growth rates for all ownership classes.

4/ All forest inventory data is taken from U.S. Department of Agriculture, South Carolina Timber, 1968, Resource Bulletin SE-13, Southeastern Forest Experiment Station, Asheville, North Carolina, 1969.

TABLE 3-19: VOLUME OF GROWING STOCK AND SAWTIMBER
COMMERCIAL FOREST LAND
ACE BASIN

Species	Growing Stock (thousand cubic feet)	Sawtimber (thousand board feet)
Softwood	1,286,639	4,298,769
Hardwood	1,435,847	3,634,118
	2,722,486	7,392,887

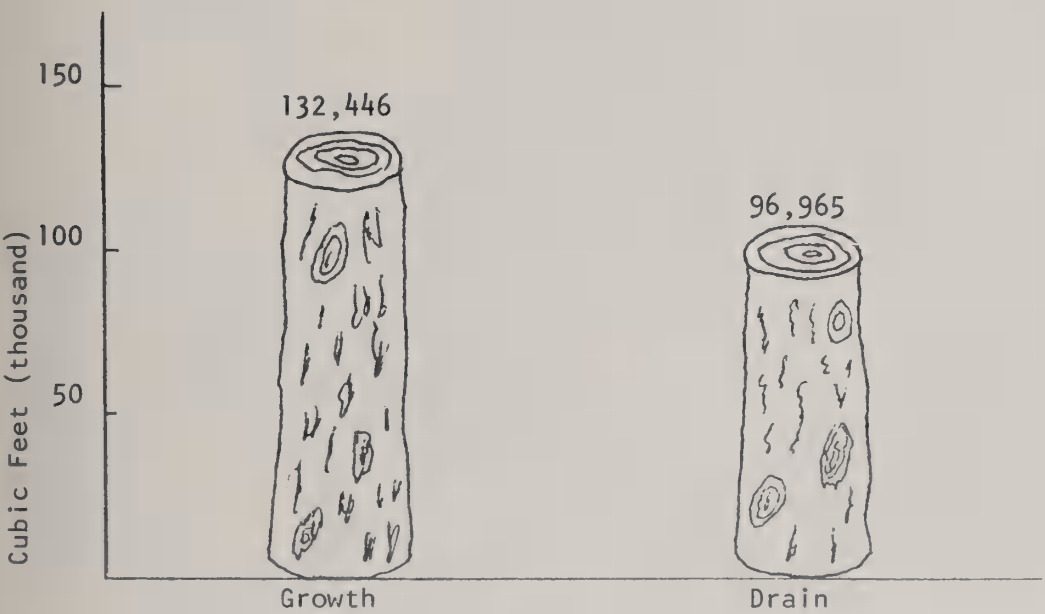

FIGURE 3-3: PRESENT TIMBER GROWTH AND DRAIN*
ACE BASIN

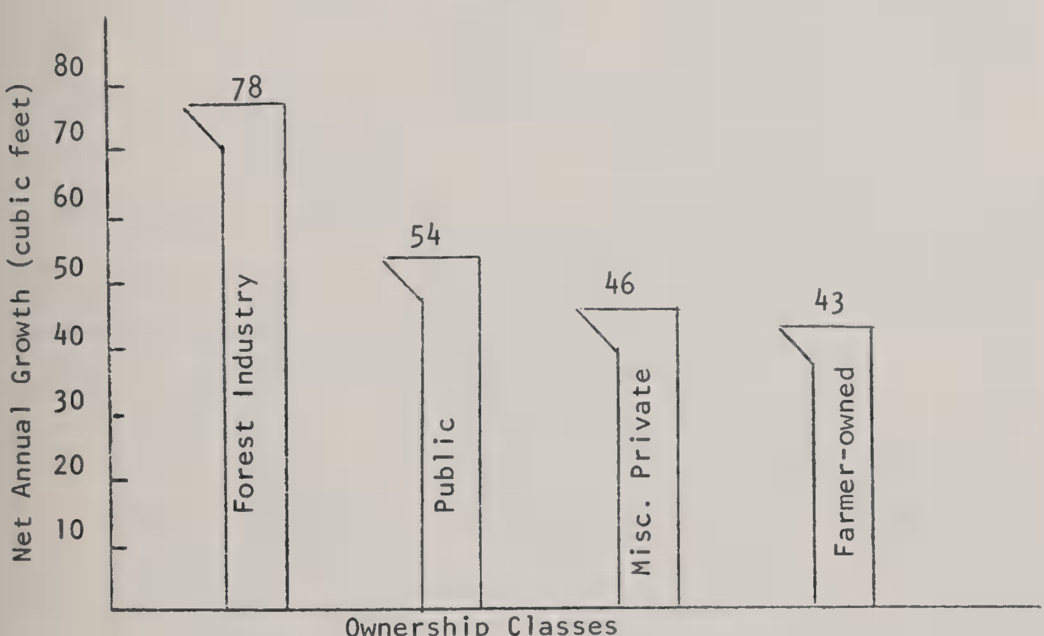

FIGURE 3-4: NET ANNUAL GROWTH* PER ACRE
BY OWNERSHIP CLASSES
ACE BASIN

*Data provided by Southeastern Forest Experiment Station, USDA, Forest Service, based on forest survey of 1968.

South Carolina's lumber industry meets the challenge to produce large volumes of top grade lumber products through use of modern, automated equipment. This interior scene is typical of the kinds of modern machinery required to process lumber logs harvested from the basin's forest lands.
(Photograph courtesy of South Carolina State Commission of Forestry)

Industry

Industrial processing of wood material in the basin reaches all levels of the economy. Products manufactured by both primary and secondary mills have an annual value in excess of 207 million dollars. The value added to the economy by utilization of wood fiber production amounts to 31.8 million dollars annually.

The forest industrial base consists of primary and secondary mills scattered throughout the basin. The primary industries are 38 sawmills, six veneer plants and four miscellaneous wood-using mills. (See Figure 3-5 for locations of primary wood-using industries.) Sixty-three secondary mills manufacture plywood, boxes, millwork, furniture, particle board, mobile homes and venetian blinds 5/.

Primary industries employ 2,170 workers who earn annual wages and

5/ Forest industrial information provided by the South Carolina State Commission of Forestry.

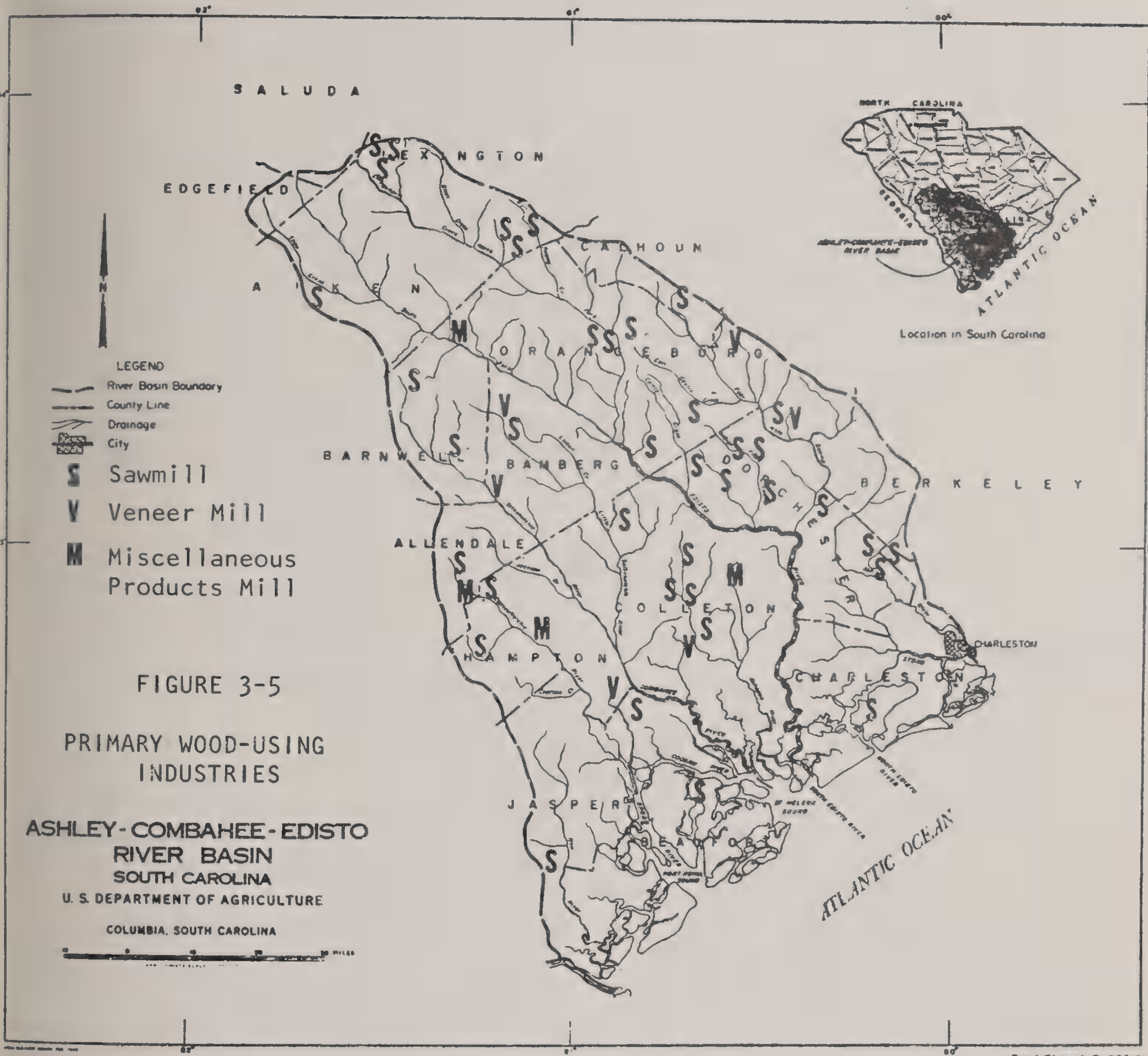

FIGURE 3-5

PRIMARY WOOD-USING INDUSTRIES

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA, SOUTH CAROLINA

SOURCE: South Carolina State Commission of Forestry

salaries of $9,989,400. The payroll for secondary industries ($15,746,500 annually) is distributed among 2,863 employees. Woods workers, 938 in number, earn wages and salaries of $4,934,400 annually for their logging and hauling work.

Forest Range

Since colonial days, forest land in South Carolina has served as open range. In recent decades, however, a shift to use of improved pasture has decreased the amount of range used for beef production.

Research in forest resource management points out that forest range can be profitably utilized as an adjunct to improved pasture or supplemental feeding. Currently, forest range in the ACE Basin is under-utilized. Only four percent of all forest land, according to the 1967 Conservation Needs Inventory, is used for range. Multiple management of timber stands to utilize forage resources can add to beef supplies without materially decreasing timber production.

Two major forest types, longleaf-slash and loblolly-shortleaf pines, provide a potential of 815,000 acres of timberland manageable for range purposes. This amount of range can provide for 32,600 animal units for each eight month grazing season or a total of 260,800 animal unit months (AUM). Data published as Bulletin NS-9 by the Georgia Agricultural Experiment Station reports annual gains of up to 185 pounds for steers supplied with ample forage in the wiregrass-pine range. Good range management applied to the basin's pine types can yield over six million pounds of beef annually.

Agricultural Resources

Structure of Farming

Farm numbers in both the ACE study area and South Carolina are declining rapidly. Between 1959 and 1969, 44 percent of all farms in the study area either became consolidated or went out of business. In 1969, 8,911 farms remained in operation (Table 3-20). Sixty percent were Class VI farms with less than $2,500 in sales. Similar figures for the state reveal an even more rapid decline. Consequently, the study area in 1969 accounted for 22.5 percent of all farms in the state, compared to 20.3 percent in 1959.

During the 1959-1969 period, 452,000 acres of farmland in the study area shifted to nonagricultural uses. This represents a loss of about one of every five acres in farms. In 1969, 2.1 million acres or 29 percent of the state's farmland was located in the study area, up from 27 percent a decade earlier. Average farm size remains well above the state average. Area farmers reported ownership of 27 percent of all farm machinery and equipment in South Carolina (Table 3-21).

Irrigation is not a common practice. Only one percent of the farms in the study area reported use of irrigation measures in 1969 (Table 3-22). Less than 4,500 acres of the 2.1 million acres in farms were irrigated.

TABLE 3-20: FARM NUMBERS, LAND IN FARMS AND AVERAGE SIZE OF FARMS
ACE STUDY AREA AND STATE
1959 - 1969

Area	1959			1969		
	Farms (Number)	Land in Farms (Thousand Acres)	Average Size of Farm (Acres)	Farms (Number)	Land in Farms (Thousand Acres)	Average Size of Farm (Acres)
Region 5	8,096	1,357	167.7	5,030	1,146	227.8
Region 9	3,919	405	103.4	1,859	287	154.8
Region 10	3,844	745	193.7	2,022	622	307.6
ACE Study Area Total	15,859	2,507	158.1	8,911	2,055	230.7
South Carolina	78,172	9,149	117.0	39,559	6,992	176.7
ACE Study Area as a Percent of South Carolina	20.3	27.4	135.1	22.5	29.4	130.6

SOURCE: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture.

TABLE 3-21: VALUE OF FARM LAND, BUILDINGS AND EQUIPMENT
ACE STUDY AREA AND STATE
1969

Area	Land and Buildings	Machinery and Equipment	Total Value
	(Million Dollars)		
Region 5	252.2	43.3	295.5
Region 9	80.9	11.2	92.1
Region 10	123.4	16.0	139.4
ACE Study Area	456.5	70.6	527.1
South Carolina	1,826.5	261.7	2,088.2

SOURCE: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture.

TABLE 3-22: IRRIGATION, NUMBER OF FARMS AND ACREAGE IRRIGATED
ACE STUDY AREA AND STATE
1959 - 1969

Area	1959			1969		
	Number of Farms Irrigated	Acres Irrigated	Acres Irrigated Per Farm	Number of Farms Irrigated	Acres Irrigated	Acres Irrigated Per Farm
Region 5	38	1,085	28.6	28	462	16.5
Region 9	29	653	22.5	21	470	22.4
Region 10	21	1,119	53.3	38	3,521	92.7
ACE Study Area Total	88	2,857	32.5	87	4,453	51.2
South Carolina	1,398	24,952	17.8	675	15,003	22.2

SOURCE: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture.

Major Crops

Acreage of major crops harvested in the study area increased 43 percent between 1969 and 1974. Statewide, an increase of 37 percent was recorded during the time period. The share of South Carolina's cropland harvested within the study area increased one percent to 34 percent (Table 3-23).

Within the basin, 69 percent of all cropland harvested was in Region 5. Orangeburg County was particularly important, accounting for one-fourth of the acres harvested in the basin. Calhoun and Allendale were also important agricultural counties.

Cotton was the only major crop to show a decrease in acreage from 1969-1974. Cotton output grew from 65,000 bales to 72,000 bales by 1974 despite the reduction of 17,000 acres (Table 3-24).

The crop showing the largest gain from 1969 to 1974 relative to the state was oats. During that time period, the basin's share increased from 27 to 45 percent.

Soybeans and corn accounted for 243,000 acres or 88 percent of the 277,000 acre increase in harvested cropland in the study area. The basin's share of state soybean acreage remained constant at 36 percent while corn acreage increased from 40 to 46 percent by 1974.

Livestock

Livestock production in South Carolina between 1969 and 1974 followed a pattern very similar to crops. The number of cattle and calves on study area farms increased 22 percent, although the basin's share of the state's cattle and calves fell slightly from 27 to 25 percent. As with crops, Region 5 and particularly Orangeburg County, appeared to be the center of livestock production. Sixty percent of all study area cattle were located in Region 5 in 1974 (Table 3-25).

An even faster growing enterprise was hog production. The number of hogs and pigs in the study area increased 77 percent from 1969 to 1974 and the basin's share increased from 42 to 50 percent. Orangeburg County had the largest number of hogs and pigs in the state. Berkeley, Colleton and Dorchester were important hog producing counties within the study area.

South Carolina trails all other South Atlantic Gulf States in broiler output. In 1974, the study area accounted for only 21 percent of all broilers in the state.

Income

Sale of farm products in the study area amounted to 214.7 million dollars in 1974 (Table 3-26). Sales, which were almost evenly divided between crops and livestock in 1969 were much higher for crops in 1974. Total sales in Region 5 were 128.2 million dollars, 60 percent of all study area sales.

Sixty percent of the study area's farms had sales of less than $2,500 in 1969 (Table 3-27). The figure ranged as high as 70 percent in Region 9 with Berkeley County reporting 77 percent of its farms in this category. Overall, 40 percent of the area's farms accounted for 95 percent of all sales.

TABLE 3-23: MAJOR CROPS HARVESTED FOR SELECTED YEARS
ACE STUDY AREA AND STATE

Crop	Region 5	Region 9	Region 10	ACE Study Area	South Carolina	ACE Study Area Share
	(Thousand Acres)					Percent
			1969			
Cotton	72	4	5	81	300	27
Corn	90	23	41	154	387	40
Wheat	19	2	6	27	65	42
Oats	16	2	4	22	83	27
Barley	2	0	0	2	15	16
Hay	22	6	9	37	151	25
Soybeans	218	26	62	306	851	36
Tobacco	0.3	0.9	0.5	1.7	69	2
Peanuts	4	0	1	5	16	36
Tomatoes	0	4	3	7	7	100
TOTAL	443.3	67.9	131.5	642.7	1,944	33
			1974			
Cotton	60	1	2	63	300	22
Corn	150	34	64	248	539	46
Wheat	48	4	7	59	158	37
Oats	27	3	6	36	77	45
Barley	3	0	0	3	24	12
Hay	23	11	7	41	220	19
Soybeans	320	38	97	455	1,249	36
Tobacco	0.2	1.3	0.6	2.1	80	3
Peanuts	4	0	1	5	15	35
Tomatoes	0	4	2	6	6	100
TOTAL	635.2	96.3	186.6	918.1	2,668	34

TABLE 3-24: PRODUCTION OF MAJOR CROPS FOR SELECTED YEARS
ACE STUDY AREA AND STATE

Crop	Unit	Region 5	Region 9	Region 10	ACE Study Area	South Carolina	ACE Study Area Share
		(Thousands)					Percent
				1969			
Cotton	Bales	60	2	3	65	236	28
Corn	Bu.	3,990	1,138	2,009	7,137	19,172	37
Wheat	Bu.	605	73	192	870	2,165	40
Oats	Bu.	724	71	150	945	3,901	24
Barley	Bu.	96	2	8	106	720	15
Hay	Tons	62	9	28	99	293	34
Soybeans	Bu.	4,674	602	1,430	6,706	18,613	36
Tobacco	Lbs.	320	1,212	631	2,163	129,169	2
Peanuts	Lbs.	7,409	0	1,154	8,563	24,800	35
Tomatoes	Tons	1.1	17.2	14.3	32.6	36.1	90
				1974			
Cotton	Bales	69	1	2	72	274	26
Corn	Bu.	8,460	2,013	3,794	14,267	31,262	46
Wheat	Bu.	1,074	72	128	1,274	3,950	32
Oats	Bu.	1,156	50	233	1,439	3,234	45
Barley	Bu.	97	3	9	109	960	11
Hay	Tons	72	23	20	115	440	26
Soybeans	Bu.	6,112	785	2,052	8,949	23,750	38
Tobacco	Lbs.	486	2,185	1,322	3,993	172,000	2
Peanuts	Lbs.	10,261	0	2,375	12,636	31,000	41
Tomatoes	Tons	0.9	14.4	9.2	24.5	27.6	89

TABLE 3-25: LIVESTOCK ON FARMS IN SELECTED YEARS
ACE STUDY AREA AND STATE

Area	Cattle and Calves	Hogs and Pigs	Broilers
	-----(Thousands)----		
	1969		
Region 5	82	91	735
Region 9	19	35	1/
Region 10	36	46	1/
ACE Study Area	137	172	735
South Carolina	516	414	4,186
Percent of State in ACE Study Area	27	42	18
	1974		
Region 5	100	168	6,561
Region 9	24	59	1/
Region 10	43	78	1/
Ace Study Area	167	305	6,561
South Carolina	670	610	31,552
Percent of State in ACE Study Area	25	50	21

1/ Less than 500 birds.

TABLE 3-26: FARM PRODUCTS SOLD IN SELECTED YEARS
ACE STUDY AREA AND STATE

Area	1969			1974		
	Crops	Livestock and Livestock Products	All Products	Crops	Livestock and Livestock Products	All Products
	(Million Dollars)					
Region 5	25.6	25.8	51.4	84.1	44.1	128.2
Region 9	8.7	5.4	14.1	24.6	10.1	34.7
Region 10	11.0	10.3	21.3	37.0	14.8	51.8
ACE Study Area	45.3	41.5	86.8	145.7	69.0	214.7
South Carolina	205.0	150.3	355.3	572.1	254.8	826.9
Percent of State in ACE Study Area	22.1	27.6	24.4	25.4	27.1	26.0

TABLE 3-27: PERCENTAGE OF FARMS IN EACH ECONOMIC CLASS
ACE STUDY AREA AND STATE
1969

Area	Class I $40,000 and Over	Class II $20,000 to $39,999	Class III $10,000 to $19,999	Class IV $5,000 to $9,999	Class V $2,500 to $4,999	Class VI Less than $2,500
Region 5	6.5	5.3	7.8	10.1	14.2	56.1
Region 9	3.5	3.2	3.9	7.8	12.1	69.4
Region 10	5.3	4.8	6.3	9.8	13.3	60.5
ACE Study Area Total	5.6	4.7	6.7	9.6	13.6	59.9
South Carolina	4.8	5.4	8.2	11.6	14.1	56.0

SOURCE: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture.

Tourism and Recreation

Tourism and travel have become increasingly important in both the ACE Basin and the state. In 1973, 28 million non-residents toured South Carolina and spent a total of 571 million dollars, most of which benefited private enterprise. Beaufort County is the state's second largest recreation center and only the Myrtle Beach area (outside the basin) is larger.

Most of the state's vacation destination business is concentrated in the coastal area. Beaches, sea islands and coastal water areas of the basin are relatively close and accessible to many states not bounded by the ocean. While residents of the eastern United States and Canada have many beaches and saltwater recreation facilities located close to home, South Carolina's mild climate offsets the disadvantages of distance and gives coastal and tidelands regions the potential to effectively compete with these other coastal areas for year-round vacation and recreation business. Table 3-28 shows the number of both resident and non-resident travelers who visited the basin in 1972. The majority are visitors from out-of-state.

TABLE 3-28: DISTRIBUTION OF VACATION, HOLIDAY AND WEEKEND AUTOMOBILE TRAVELERS VISITS ACE BASIN 1972

	Non-Resident	Resident	Total
Number	3,286,544	1,078,940	4,365,484
Percent of State Total	25.0	17.0	22.0

SOURCE: South Carolina Department of Parks, Recreation and Tourism, South Carolina Overall Recreation Plan (SCORP), Columbia, South Carolina, 1975.

CHAPTER 4 - PROJECTIONS

Methodology

Procedures for projecting the general and agricultural economies are basically the same at the state level. Secondary historical data were collected, trends were examined to determine the historical direction and rate of change during the projection period and national and state influences were considered. The general economy projections presented in this chapter are based on historical data which include some resource development.

Projections for the state agricultural sector and the study area general economy are consistent with national projections developed jointly by the U.S. Departments of Commerce and Agriculture, commonly referred to as the OBERS Projections 1/. This study used the Series C projections for population, employment and income. The baseline projections for the state agricultural sector are based on OBERS Series E' projections which estimated lower population growth and higher agricultural exports. Baseline projections for livestock and soybean production were adjusted to levels more consistent with historical trends and expected enterprise composition. All other baseline projections for the agricultural sector correspond to the OBERS Series E' projections. See Appendix O for further discussion of the state agricultural model.

The OBERS framework assumes no major wars or serious depressions will disrupt the economy. It does not preclude, however, cyclical variations in economic activity. Generally favorable economic conditions and a continuing upward trend in population are assumed. All monetary values for both the general and agricultural economies were converted to 1972 prices by the Consumer Price Index.

The accuracy of any projection is unknown and can only be developed within broad confidence limits. The reliability of projections for any given subarea would be related to the size of the area and any allocation of national projections to subareas reduces the confidence level. It is important to keep in mind that projections are not to be considered as goals or constraints on a region's economic activity. No judgment is implied as to their relative merit. The projections are intended to be a best estimate of the likely level of economic activity, based largely on historic trends and other simplifying assumptions and are meant to serve as additional information

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1/ OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, Washington, D.C., Government Printing Office, 1972.

on which to base planning decisions, not as goals or ends in themselves.

Population

Population within the ACE study area is expected to double during the next 50 years, reaching 1.07 million persons by 2020 (Table 4-1). This is an annual increase of about 1.4 percent, comparable to the expected rate of national gain. One-half of the increase is expected in Region 9, which includes the City of Charleston. The slowest rate of population increase is expected in Region 10.

Employment

In 1970, 32 percent of the study area's population was employed compared to 38 percent nationally. The United States and the study area are both expected to increase their percent of population employed by 2020, with 41 percent of the nation's inhabitants working compared to 37 percent (approximately 398,000 persons) employed in the study area by that time (Table 4-2). The area is not expected to increase its share of South Carolina's total employment, however.

Largest gains are projected for manufacturing, services and trade employment. Approximately one-fifth of the increase by 2020 is expected in manufacturing with 40,000 new jobs anticipated, primarily in Regions 5 and 9. These two regions will also account for the bulk of increased service and trade employment (Table 4-3).

Income

Median family income in the study area is expected to continue to trend in the same direction as the nation and the state. However, the amount of the increase may not be large enough to enable the study area to reach national levels (Table 4-4), as industries located in the study area and projected for the area generally are relatively low-wage and probably will remain so. These projections assume that the average family size will remain unchanged and that income from various sectors will have the same relative importance as in 1970.

Per capita income in the study area is projected to increase in the future as income levels in the area trend more toward national averages. Project study area incomes, however, probably will not reach the average per capita income level of the United States. (See Table 4-5.) The projection table shows that per capita incomes in the study area will be slightly below state per capita figures but will average only 71 percent of the United States' figure in 2020.

TABLE 4-1: PROJECTED TOTAL POPULATION
ACE STUDY AREA AND SELECTED AREAS
1970 - 2020

Area	1970 1/	1990 2/	2020 2/
	(thousands)		
Region 5	214	250	354
Region 9	336	415	563
Region 10	107	124	158
Study Area	657	788	1,075
South Atlantic Gulf	23,490	31,072	47,568
United States	203,213	234,208	399,013

1/ U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

2/ Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

TABLE 4-2: PROJECTED TOTAL EMPLOYMENT
ACE STUDY AREA AND SELECTED AREAS
1969 - 2020

Area	1969	1990	2020
	----------(thousands)----------		
Study Area	202	277	395
South Carolina	954	1,406	2,035
South Atlantic Gulf	9,448	12,437	19,409
United States	80,975	106,917	163,622

SOURCE: Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

TABLE 4-3: PROJECTED EMPLOYMENT
ACE STUDY AREA
1970 1/ - 2020 2/

Area	Agriculture, Forestry and Fisheries	Contract Construction	Manufac-turing	Transportation, Communications and Utilities	Wholesale & Retail Trade	Finance, Insurance & Real Estate	Services	Civilian Government	Total
	(thousands)								
Region 5									
1970	4.8	5.5	25.1	3.2	11.6	2.1	17.3	2.1	71.7
1990	2.5	7.3	27.3	3.8	18.8	3.3	32.2	3.2	98.4
2020	2.1	9.9	37.2	5.5	22.9	5.1	41.1	5.1	128.9
Region 9									
1970	2.2	7.8	24.3	6.8	19.6	4.1	29.5	8.8	103.1
1990	1.9	10.1	33.3	8.7	26.4	5.4	45.5	10.7	142.0
2020	1.7	14.9	44.8	17.0	37.5	8.2	68.6	16.8	209.5
Region 10									
1970	2.3	2.9	6.3	1.6	5.0	0.9	6.2	2.3	27.5
1990	1.9	3.7	8.7	2.0	6.7	1.2	9.5	2.7	36.4
2020	1.9	4.8	12.1	4.3	10.0	2.0	16.7	4.4	56.2
Study Area									
1970	9.3	16.2	55.7	11.6	36.2	7.1	53.0	13.2	202.3
1990	6.3	21.1	69.3	14.5	51.9	9.9	87.2	16.6	276.8
2020	5.7	29.6	94.1	26.8	70.4	15.3	126.4	26.3	394.6

1/ U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

2/ Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

TABLE 4-4: PROJECTED MEDIAN FAMILY INCOME
ACE STUDY AREA
1972 - 2020

Area	1972	1990	2020
Region 5	7,900	16,500	38,200
Region 9	8,500	17,400	41,200
Region 10	6,600	13,600	32,000
Study Area	8,000	16,000	38,500

SOURCE: Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

TABLE 4-5: PROJECTED PER CAPITA INCOME
ACE STUDY AREA AND SELECTED AREAS
1970 - 2020

Area	1970 1/	1990 2/	2020 2/
Region 5	2,300	4,500	11,200
Region 9	2,600	5,200	12,700
Region 10	2,100	4,200	10,400
Study Area	2,400	4,800	11,900
South Carolina	2,500	5,000	12,200
United States	3,400	7,400	16,800

1/ U.S. Department of Commerce, Bureau of the Census, Census of Population 1970, General Social and Economic Characteristics, final report PC(1) C42 South Carolina, 1971.

2/ Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

The ACE Basin share of the OBERS level of agricultural production for the state was determined with the use of a state linear programming model. Clemson agricultural specialists, Soil Conservation Service agronomists and soil scientists and other specialists supplied the technical data needed as inputs for this model. The ACE share of projected state demand is shown in Table 4-6 for the 12 major crops included in the model.

Forage production is expected to greatly increase by 1990.

The higher levels of production forecast for 1990 and 2020 imply substantial changes in land use. In addition, the OBERS projections assume a reduction of the cropland base by 64,000 acres in the state by 1990 due to competing land uses, including urban and industrial growth, transportation, parks and recreation, wildlife sanctuaries, vacation communities, reservoirs and surface mining. A further reduction of 47,000 acres is assumed between 1990 and 2020. These reductions in cropland will be more than offset by an assumed 289,000 acre increase in cropland by 1990 from resource development activities such as conversion of pastureland to cropland on land Classes I, IIe and IIw and forest land on Classes I and IIe. In the same way, an additional 264,000 acres would be added to cropland between 1990 and 2020. Because of increased future demand for agricultural production, it is assumed that idle cropland will decrease as more land enters active production. Expected land use is discussed in detail in later

TABLE 4-6: AGRICULTURAL PRODUCTION BY COMMODITY

ACE BASIN

Commodity	Units	Historical 1972	Projected 1990	Projected 2020
		(thousands)		
Cotton	Pounds	31,378	8,340	16,837
Corn	Bushels	9,220	10,740	27,200
Wheat	Bushels	847	728	652
Oats	Bushels	732	691	165
Barley	Bushels	170	770	1,215
Roughage	Tons	260	358	985
Sorghum	Bushels	42	12	0
Soybeans	Bushels	5,678	14,088	10,095
Tobacco	Pounds	2,904	1,740	1,017
Peanuts	Pounds	7,446	14,000	16,050
Peaches	Bushels	310	362	208
Tomatoes	Tons	24	31	22

chapters where each of the various plans is presented.

Forestry

Commercial forest acreage in the basin is expected to decline gradually as more and more forest land is converted to agricultural and urban uses. It is estimated that by 2020, commercial forest acreage will have declined to about 2.5 million acres, a 4.7 percent drop since 1968.

Although commercial forest acreage is expected to decline in the basin, the supply of timber is expected to increase gradually. Timber harvested in 1968 represented only 73 percent of the net annual growth for that year. It is anticipated that removal will reach 100 percent of net annual growth by 2020 and that will level off at about 160 million cubic feet per year. (See Table 4-7.) With intensive management, including planting on idle cropland and regenerating poorly stocked stands, net annual growth and annual harvest could approach 190 million cubic feet per year.

Harvesting pulpwood in a pine stand managed for sawtimber.
(Photograph courtesy of South Carolina State Commission of Forestry)

If demand increases at the rate anticipated, even intensive forest management will not enable the supply of wood fiber to keep pace with demand. The implication is that either the forest land base must be increased or the price of timber must rise until demand is brought in

TABLE 4-7: PROJECTED WOOD SUPPLY AND DEMAND
ACE BASIN
1968 - 2020 1/

Year	Quantity Demanded 2/	Quantity Supplied 3/	Expected Net Annual Growth 3/	Potential Net Annual Growth 4/
	(million cubic feet)			
1968	97	97	132	197
1980	108	102	138	197
1990	123	106	141	196
2020	208	133	160	188

1/ All projections are based on the assumption that the price of wood will remain constant relative to the prices of other goods and services.

2/ Derived from OBERS Projections, Economic Activity in the United States, prepared by the U.S. Department of Commerce and U.S. Department of Agriculture for the U.S. Water Resources Council, 1972.

3/ Based on trends identified in Herbert A. Knight and Joe P. McClure, Opportunities for Increasing Timber Supplies in the Southeast, USDA Forest Resource Bulletin SE-28, 1974. Estimates of "expected net annual growth" assume a continuation of the current trends in management.

4/ Estimates of "potential net annual growth" represent the maximum productive capacity of the land base under intensive management. Projections are based on the assumption that forest acreage will decline in equal proportion in all site classes.

line with supply.

Columns 2 and 3, Table 4-7, show the relationship of anticipated demand to anticipated supply or harvest, assuming no changes in current practices in growing timber and in harvesting. These projections of demand and harvest are graphically illustrated in Figure 4-1.

Municipal and Industrial Water Use

The South Carolina Water Resources Commission projected water use for public water supplies through 2020 2/. Population served and per capita consumption were established for 1970 from data furnished by existing public water supply facilities. Projected per capita use was based on projections presented in Chapter I of The Nation's Water Resources 3/, prepared by the U.S. Water Resources Council. Residential and commercial water use will increase 49 percent and industrial water use will increase 115 percent by the year 2020. Water use projections for public systems are shown in Table 4-8 for counties and regions.

Assuming the per capita consumption of the rural population for all uses is about equal to per capita use by public systems, projections were made for rural water use. Water use by the rural population is expected to increase by 73 percent by the year 2020. Projected water use by public systems and by the rural population is shown in Table 4-9.

Recreation

Projected demands for recreation activities, including hunting and fishing, are based on population projections and average number of yearly occasions per person. Demands for recreational activities will increase by 25 to 50 percent by the year 2020. Table 4-10 shows present and projected user occasions for selected activities.

2/ South Carolina Water Resources Commission, "ACE" Framework Study, Ashley-Combahee-Edisto River Basin, Columbia, South Carolina, 1972.

3/ Water Resources Council, The Nation's Water Resources, The First National Assessment of Water Resources Council, Washington, D.C., Government Printing Office, 1968.

FIGURE 4-1: PROJECTED WOOD SUPPLY AND DEMAND

ACE BASIN

TABLE 4-8: PROJECTED WATER USE
PUBLIC WATER SUPPLY FACILITIES FOR COUNTIES AND REGIONS
ACE BASIN

	1975	1990	2020
REGION 5			
Aiken County			
Population served	29,700	33,500	40,000
Per capita use	109.7	111.9	113.0
Average use (mgd)	3.3	3.7	4.5
Industrial water use (mgd)	1.1	1.5	2.4
Existing capacity (mgd)	7.496		
Allendale County			
Population served	5,700	5,700	5,700
Per capita use	102.7	104.7	105.8
Average use (mgd)	0.59	0.60	0.60
Industrial water use (mgd)	0.01	0.02	0.04
Existing capacity (mgd)	2.255		
Bamberg County			
Population served	9,300	9,600	10,000
Per capita use	138.0	141.1	142.5
Average use (mgd)	1.3	1.4	1.4
Industrial water use (mgd)	0.07	0.09	0.15
Existing capacity (mgd)	3.432		
Barnwell County			
Population served	12,400	13,000	13,500
Per capita use	151.8	154.8	156.4
Average use (mgd)	1.9	2.01	2.11
Industrial water use (mgd)	2.76	3.61	5.89
Existing capacity (mgd)	10.29		
Orangeburg County			
Population served	33,500	38,000	43,000
Per capita use	87.5	89.3	90.2
Average use (mgd)	2.93	3.39	3.88
Industrial water use (mgd)	0.90	1.18	1.93
Existing capacity (mgd)	11.22		
REGION TOTAL			
Population served	90,600	99,800	112,200
Average use (mgd)	10.02	11.1	12.49
Industrial water use (mgd)	4.84	6.4	10.41
Existing capacity (mgd)	34.69		

TABLE 4-8: PROJECTED WATER USE
PUBLIC WATER SUPPLY FACILITIES FOR COUNTIES AND REGIONS
ACE BASIN

	1975	1990	2020
REGION 9			
Charleston County			
Population served	179,000	208,500	277,000
Per capita use	122	124	126
Average use (mgd)	21.84	25.85	34.89
Industrial water use (mgd)	9.21	12.01	19.62
Existing capacity (mgd)	42.36		
Dorchester County			
Population served	16,500	18,500	23,000
Per capita use	87.8	89.6	92.3
Average use (mgd)	1.45	1.65	2.05
Industrial water use (mgd)	0.02	0.03	0.05
Existing capacity (mgd)	2.63		
REGION TOTAL			
Population served	195,500	227,000	300,000
Average use (mgd)	23.29	27.5	36.94
Industrial water use (mgd)	9.23	12.04	19.67
Existing capacity (mgd)	44.99		

NOTE: Public water systems in the Berkeley County portion of the Basin are served by Charleston and Dorchester Counties.

TABLE 4-8: PROJECTED WATER USE
PUBLIC WATER SUPPLY FACILITIES FOR COUNTIES AND REGIONS
ACE BASIN

	1975	1990	2020
REGION 10			
Beaufort County			
Population served	17,800	20,500	26,000
Per capita use	82.8	84.5	85.3
Average use (mgd)	1.47	1.73	2.22
Industrial water use (mgd)	0.02	0.03	0.05
Existing capacity (mgd)	8.8		
Colleton County			
Population served	12,700	13,500	15,000
Per capita use	80.3	81.9	83.7
Average use (mgd)	1.02	1.10	1.26
Industrial water use (mgd)	0.24	0.31	0.51
Existing capacity (mgd)	5.09		
Hampton County			
Population served	9,500	10,000	10,000
Per capita use	112.1	114.4	115.5
Average use (mgd)	1.07	1.14	1.16
Industrial water use (mgd)	0.03	0.07	0.12
Existing capacity (mgd)	4.807		
Jasper County			
Population served	3,300	3,500	4,000
Per capita use	121.5	124.0	125.2
Average use (mgd)	0.40	0.43	0.50
Industrial water use (mgd)	0.03	0.07	0.12
Existing capacity (mgd)	3.51		
REGION TOTAL			
Population served	43,000	47,500	55,000
Average use (mgd)	3.96	4.39	5.14
Industrial water use (mgd)	0.32	0.48	0.80
Existing capacity (mgd)	22.21		

TABLE 4-8: PROJECTED WATER USE
PUBLIC WATER SUPPLY FACILITIES FOR COUNTIES AND REGIONS
ACE BASIN

	1975	1990	2020
OTHER			
Edgefield County			
Population served	3,600	3,800	4,000
Per capita use	99.7	101.7	102.7
Average use (mgd)	0.36	0.39	0.41
Industrial water use (mgd)	0.06	0.08	0.13
Existing capacity (mgd)	0.76		
Lexington County			
Population served	7,800	10,500	16,000
Per capita use	224.6	229.1	231.4
Average use (mgd)	1.75	2.41	3.70
Industrial water use (mgd)	-	-	-
Existing capacity (mgd)	3.158		
SUBTOTAL			
Population served	11,400	14,300	20,000
Average use (mgd)	2.11	2.80	4.11
Industrial water use (mgd)	0.06	0.06	0.13
Existing capacity (mgd)	3.92		
BASIN TOTAL			
Population served	340,800	388,600	487,200
Average use (mgd)	39.38	45.57	58.68
Industrial water use (mgd)	14.45	18.89	31.01
Existing capacity (mgd)	105.81		

TABLE 4-9: PROJECTED TOTAL WATER USE
BY PUBLIC WATER SYSTEMS AND THE RURAL POPULATION
ACE BASIN

	1975	1990	2020
PUBLIC SYSTEMS			
Population served	340,800	388,600	487,200
Per capita use	116	118	120
Average use (mgd) (domestic & industrial)	58.8	64.5	89.7
RURAL POPULATION			
Population served	117,200	196,400	195,800
Per capita use	116	118	120
Average use (mgd)	13.6	23.2	23.5
TOTAL POPULATION	464,000	585,000	783,000
COMBINED USE (mgd)	72.4	87.7	113.2
EXISTING CAPACITY (mgd) (Public systems)	105.8		

TABLE 4-10: PROJECTED ANNUAL USER OCCASIONS
FOR SELECTED ACTIVITIES
ACE BASIN

	1975	1990	2020
	(thousands)		
Visits to Historical Cities & Places	5,307	6,018	7,441
Commercial Attractions, Gardens & Amusements	3,833	4,313	5,273
Attending Shows, Events & Concerts	1,133	1,261	1,519
Watching Sports & Racing	1,535	1,668	1,933
Golfing	1,342	1,478	1,760
Horseback Riding	855	945	1,131
Camping	1,077	1,220	1,446
Beaches & Swimming	5,916	6,520	7,980
Boating & Fishing	2,365	2,602	3,032
Hunting	1,580	1,713	1,961

SOURCE: Derived from South Carolina Outdoor Recreation Plan (SCORP)-70, South Carolina Department of Parks, Recreation and Tourism, Columbia, South Carolina, 1970.

CHAPTER 5 - FUTURE WITHOUT CONDITION

Future without plan conditions are described in order to assist in identification of needs, formulation of alternative plans and comparison of alternatives. The future without condition is defined as "the level of development of water and land resources without federally assisted projects, without group type projects, and without acceleration of going programs". Estimates of future without plan conditions will provide a basis for evaluation of federally assisted programs. Component needs are the differences between without condition and the desired future condition. Both economic and environmental objectives are considered.

Assumptions

General

It is assumed that historical trends will continue. Land treatment programs such as soil and water conservation district programs with technical assistance will remain at their present levels, state and other programs will remain at present levels, technology will result in higher per acre yields and farmers will have freedom to choose their farming enterprises.

Even though technology will result in higher yields through improved varieties and chemicals and tillage practices, yields on some soils will be reduced over time as drainage systems deteriorate and erosion removes the productive soil layer. As more acres are brought into production, average yields per acre may be lower if increased production comes from marginal land.

Economic Considerations

Projections of agricultural production at the national level (OBERS Projections) have been made by the U.S. Department of Agriculture. These projections are based on requirements for domestic consumption and estimated exports. They have been disaggregated to the state level and reflect an emphasis on maintenance of a steady flow of products that meet domestic and export demands, rather than fluctuating production that results in either shortages or surpluses.

The ACE Basin level of agricultural production under without plan conditions was projected with the assistance of a linear programming model. The model found the least cost (most efficient) method of producing the expected ACE share of the OBERS production level for South Carolina. Restrictive assumptions which made the final projections more realistic were used along with the programming

output. The following are the major assumptions used for this study:

(1) The capacity of each soil type to maintain long term productivity under various levels of cultivation intensity was a factor in estimating future crop yields.

(2) Future location of specific crop acreage was partially restricted by location in the base year. Limiting the magnitude of shifts in crop production from one area of the state to another was assumed to reflect the resistance or inability to change on the part of both individual operators and farming communities.

(3) The proportion of cropland in production of minor crops in 1972 was approximately six percent. It was assumed that as future crop production increases in some major crops, minor crops would account for five percent of all cropland in 1990 and four percent in 2020.

(4) Cultivation of agricultural crops on land Classes VI, VII and VIII was assumed to drop 50 percent by 1990 and another 50 percent of the remainder by 2020. This was due to the inability of such soils to maintain long term productivity.

(5) The failure rate for each crop was assumed to be the same in the future as the average in the period from 1970-75.

(6) Forest land cleared for crop use could be as much as 25 percent of the forest land on Classes I and IIe soils in 1990 and as much as 50 percent in 2020. Forest land would not be cleared until existing Classes I and IIe cropland was utilized.

(7) Forest land planted on cropland would be available for harvest by 2020 but not by 1990. There were no restrictions on which types of cropland could be converted to forest land, but essentially only idle cropland would be converted.

Within these limiting restrictions, crops were produced according to least cost (most efficient) criteria. Detailed input data used in the model such as soil groupings, acreage and crop yields by soil groupings and state and basin programming output is available upon request.

Social Considerations

Social characteristics also need to be described in order to determine the future conditions without a plan. The population of the basin is expected to increase. Most of this increase will be near major population centers, such as Savannah, Charleston, Orangeburg, Columbia and Augusta where industrial employment is more promising. Full employment and no major military conflicts are assumed. Labor productivity will increase at a decreasing rate during the planning period. Future populations will demand higher quality products.

Environmental Considerations

Future without conditions include environmental considerations. The basin's population has expressed a strong desire for protection of the environment, even at the expense of some economic development. If future production requirements are to be met without harmful effects to the environment, a variety of factors must be considered. Some of these are land clearing, use of land within its capability, erosion and sediment levels, use of agricultural chemicals, natural beauty and maintenance of forest cover.

Going Programs

Although programs of state agencies should not be greatly changed by the 'without development" assumption, the roles of federal agencies will be altered. There will be no new flood prevention and drainage projects constructed with federal assistance, no group type projects installed with federal assistance, and no acceleration of going programs.

Certain programs related to agricultural production are assumed to continue as part of the future conditions without a plan. Included are soil and water conservation and erosion control programs of the soil and water conservation districts, with technical assistance provided by the Soil Conservation Service and U.S. Forest Service, and agricultural research carried out by the U.S. Department of Agriculture, colleges, universities and private enterprise.

Continuing programs designed to reduce nonagricultural floodwater damage such as the flood insurance program administered by the U.S. Department of Housing and Urban Development and land use planning by all levels of government are assumed to continue.

The supply and distribution of public water will continue to be served by these programs: (1) county water planning, (2) ground water studies by the U.S. Geological Service and the South Carolina Water Resources Commission, (3) community loans from the Farmers Home Administration and (4) grants by the U.S. Department of Housing and Urban Development.

State laws and federal laws such as the Clean Water Act (Public Law 92-500) and the National Environmental Policy Act will continue to provide regulations that protect water quality.

Continuing programs related to forestry are: (1) the fire fighting system, the insect and disease control program and the seedling nurseries administered by the South Carolina State Commission of Forestry, (2) technical assistance by the State Commission of Forestry and the U.S. Forest Service, and (3) all government and

private research programs.

Recreational programs assumed to continue are: (1) the state park system administered by the South Carolina Department of Parks, Recreation and Tourism, (2) grants for recreational development from the Bureau of Outdoor Recreation and the Farmers Home Administration, (3) technical assistance from the Soil Conservation Service and (4) private development.

In the projected without conditions, federal assistance is assumed to be excluded from all new flood prevention and drainage projects and group projects. In addition, no federal programs will be accelerated under the future conditions without a plan.

Three PL-566 watershed projects (Willow Swamp, Horse Range Swamp and Upper New River) are assumed to be installed and to be maintained throughout their useful lives as planned. Approximately 16 resource conservation and development (RC&D) project measures are assumed to be installed for the purposes of flood prevention and drainage.

General Description of Future Without Plan Conditions

To arrive at net component needs that should be considered in a plan to change the future to desired conditions, individual problems were analyzed. The analysis included present magnitudes, future changes and impacts of going programs on these problems. Based on this, future without plan conditions were projected.

Land Use

The land base for production of agricultural and forest products will diminish over time as more land is converted to highways, homes, industries, lakes and other uses. More pressure will be placed on the remaining acres for production. Much of the idle land will be brought into production, and some forest land will be cleared for crops and pasture. Some areas will be planted to trees. Some fields, too wet to farm without proper treatment, will be allowed to revert to brush. Estimated land use without plan conditions is shown in Table 5-1.

The higher levels of production forecast for 1990 and 2020 imply substantial changes in land use, even though it is assumed that no further resource development will take place. Table 5-1 shows that there was a considerable amount of agricultural land not in production in 1972. Idle cropland and pasture are expected to decrease rapidly until 2020, when essentially all agricultural land in the basin will be used for crop and forage production. Competition for land resources is also emphasized by the large acreages of land expected to be converted from one use to another. Additions to the cropland base will be offset by land converted from cropland to urban and industrial uses and by land converted from pasture to forest production. It is likely that before 2020, commercial forest land will no longer be able to meet all demands placed upon it. Converting cropland to urban and industrial uses will aggravate problems caused by a shrinking agricultural land base. Under the assumptions of no further resource development, land resources will be fully utilized

TABLE 5-1: HISTORICAL AND PROJECTED LAND USE

ACE BASIN

	1972	1990	2020
	(Thousand Acres)		
Planted Cropland and Pasture 1/	824.6	947.4	1,047.1
Cropland Failure	29.7	31.1	22.7
Harvested Cropland and Pasture	794.9	916.3	1,024.4
Idle Cropland and Pasture	346.7	207.3	100.0
Forest Land	2,648.0	2,628.0	2,521.0
Forest Converted to Cropland 2/	-	120.7	223.6
Pasture Converted to Forest 2/	-	99.0	285.3
Cropland and Pasture Converted to Urban and Industrial Use 2/	-	16.0	26.3
Small Water	23.5	24.5	27.0
Large Water	127.9	129.0	130.0
Other Land	349.5	350.0	351.0

1/ Includes acreage estimates for minor crops.
2/ Increased acreage from 1972 to projected time period.

by competing needs by 2020.

Regional agricultural land use for both historical and projected periods is presented in Table 5-2. In general, as the area described becomes smaller, the information is less reliable but these tables do show important trends in agricultural land use in the three regions within the ACE Basin. Much of the increase in basin cropland will come from Regions 9 and 10. There will be strong competition for cropland in Region 9 from industrial and urban uses in the Charleston area. It is also possible that increased cropland use in Region 10 will have an important impact on the tourist industry based there.

<u>Agricultural Production</u>

Although production and acreage of some crops are expected to decline in the ACE Basin by 2020, overall production of agricultural goods is expected to increase. This is particularly the case with corn, soybeans and roughage for livestock. Total acreage of these three products is expected to increase by 210,000 acres in the basin by 1990 and an additional 116,000 acres by 2020.

Agricultural production under without plan conditions is expected to be at the OBERS level projected in Chapter 4. This level of agricultural output will require active production on essentially all cropland and pasture in the ACE Basin. Even though this expected level of production will be met under without plan conditions, considerable savings in production costs would be possible if land treatment programs (presented later) were implemented.

Major crop production levels, yields and acreages expected under without plan conditions are shown in Table 5-3.

<u>Forestry Production</u>

Acreage in commercial forest land is expected to decline gradually as more forest land is converted to agricultural and urban uses. In spite of the drop in forest acreage, the supply of timber in the basin will gradually increase over the next two or three decades because of continued reforestation of idle land and better management of existing forest stands. The gradual increase in wood fiber production will level off at 160 million cubic feet by 2020. The demands for forest products, however, will eventually exceed the supply, assuming that timber prices maintain their same relative position with the prices of other goods and services.

<u>Water Use</u>

Population increases and increasing industrialization will result in greater demands for water in the future. Water use for all purposes is projected to increase from 72 million gallons per day (mgd) in 1975 to 88 mgd in 1990 and 113 mgd in 2020. It is also projected that water needed for irrigation of cropland will increase from 10,000 acre feet in 1972 to 22,000 acre feet in 1990 and 36,000 acre feet in 2020.

TABLE 5-2: HISTORICAL AND PROJECTED LAND USE BY REGIONS

ACE BASIN

	1972	1990	2020
	(Acres)		
		Region 5	
Planted Cropland 1/	492,700	405,100	229,600
Hay and Pasture	108,800	115,700	299,400
Idle Land for Crops and Pasture	207,200	136,800	66,000
		Region 9	
Planted Cropland 1/	70,100	143,300	191,700
Hay and Pasture	3,600	9,700	8,500
Idle Land for Crops and Pasture	50,300	24,300	11,700
		Region 10	
Planted Cropland 1/	138,100	232,400	286,100
Hay and Pasture	11,300	37,300	31,800
Idle Land for Crops and Pasture	89,300	46,200	22,300

1/ Includes acreage for minor crops and cropland failure.

TABLE 5-3: PRODUCTION DATA FOR MAJOR CROPS

ACE BASIN

	1972	1990	2020
Cotton			
Acres Harvested	75,200	16,300	28,500
Average Yield per Acre (lbs.)	417.3	511.7	590.8
Production (1,000 lbs.)	31,378	8,340	16,837
Corn			
Acres Harvested	144,700	151,200	295,700
Average Yield per Acre (bu.)	63.7	71.0	92.0
Production (1,000 bu.)	9,220	10,740	27,200
Wheat			
Acres Harvested	43,700	17,300	12,300
Average Yield per Acre (bu.)	19.4	42.1	53.0
Production (1,000 bu.)	847	728	652
Oats			
Acres Harvested	20,700	12,800	2,500
Average Yield per Acre (bu.)	35.4	54.0	66.0
Production (bu.)	732	691	165
Barley			
Acres Harvested	5,300	14,300	18,400
Average Yield per Acre (bu.)	32.3	53.8	66.0
Production (1,000 bu.)	170	770	1,215
Roughage			
Acres Harvested	123,700	162,700	339,700
Average Yield Per Acre (tons)	2.1	2.2	2.9
Production (1,000 tons)	260	358	985
Sorghum			
Acres Harvested	1,300	300	0
Average Yield per Acre (bu.)	32.3	40.0	-
Production (1,000 bu.)	42	12	0
Soybeans			
Acres Harvested	321,600	485,800	280,300
Average Yield per Acre (bu.)	17.7	29.0	36.0
Production (1,000 bu.)	5,678	14,088	10,095
Tobacco			
Acres Harvested	1,400	700	300
Average Yield per Acre (lbs.)	2,118.0	2,485.0	3,100.0
Production (1,000 lbs.)	2,904	1,740	1,017
Peanuts			
Acres Harvested	3,800	5,200	4,500
Average Yield per Acre (lbs.)	1,947.0	2,692.0	3,567.0
Production (1,000 lbs.)	7,446	14,000	16,050
Peaches			
Acres Harvested	1,900	2,100	1,100
Average Yield per Acre (bu.)	163.2	172.5	189.1
Production (1,000 bu.)	310	362	208
Tomatoes			
Acres Harvested	5,700	5,700	3,400
Average Yield per Acre (tons)	4.2	5.4	6.4
Production (1,000 tons)	24	31	22
Acreage With Crop Failures	29,700	31,000	22,700
Total Acreage	781,000	905,400	1,009,400

Specific Description of Future Without Plan Conditions

As previously stated, the purpose of this study is to develop plans which will enhance the quality of life of the basin's residents through contributions to the national economic development and environmental quality objectives. The preceding section described future conditions as they are expected to be if no development occurs. An analysis of these conditions reveals that certain problems will still exist which will prevent the basin's residents from reaching their objectives. A description of these problems follows.

Soil Loss

Sheet erosion is the major cause of soil loss in the basin. Cultivated fields contribute 90 percent of the soil loss through erosion. Annual erosion rates on cropland average 2.0 to 9.2 tons per acre. These rates under without plan conditions will increase slightly as more idle land is brought into production. Rates of erosion on pasture and forest land are much lower and are not expected to change in the future as shown in Table 5-4. Even though there is erosion in all counties, the major areas are in Calhoun, Orangeburg, Bamberg, Lexington and Aiken Counties. Some of the productive soils in Calhoun and Orangeburg Counties are eroding at an alarming rate.

Floodwater Damage and Lack of Drainage

An estimated 2,590,500 acres of land in the basin have excess water problems caused by flooding or a high water table. On agricultural land, losses are measured in reduced production, higher production costs and lower quality products. Potential growth rates are limited by excess water on forest land. Naturally wooded swamps make up about half of the total area of wet soils and are not included in the area considered for flood control and drainage.

Losses from cropland and pastureland are projected to increase since older systems will deteriorate and additional land will be brought into crop production. Losses from other land uses are expected to remain about constant, that is, replacement of systems will equal deterioration. (See Table 5-5).

Nonagricultural Floodwater Damage

At least 78 communities experience floodwater damages. Floodwater in homes often damages floors, furniture, clothing and heating systems. Businessmen have reported damages to merchandise and buildings. Additional properties are subject to flooding during unusually high tides. Roads, streets and bridges receive structural damage when covered with water. Lawns, shrubs and other values are lost due to standing floodwater. Septic tank drain fields and sewage collection systems do not operate properly during times of high water. Future without conditions show increasing floodwater damages. (See Table 5-6.)

TABLE 5-4: SOIL LOSS

ACE BASIN

Item	1972	1990	2020
Cropland			
Area (acres)	700,900	780,800	707,400
Soil loss (tons)	4,275,500	5,153,300	4,598,100
Average rate (tons/acre)	6.1	6.6	6.5
Idle Cropland			
Area (acres)	346,700	207,300	100,000
Soil loss (tons)	138,700	82,900	40,000
Average rate (tons/acre)	0.4	0.4	0.4
Grassland			
Area (acres)	123,700	162,700	339,700
Soil loss (tons)	24,700	32,500	67,900
Average rate (tons/acre)	0.2	0.2	0.2
Forest Land			
Area (acres)	2,648,000	2,628,000	2,521,000
Soil loss (tons)	*	*	*
Average rate (tons/acre)	*	*	*

* Negligible

TABLE 5-5: AGRICULTURAL FLOODWATER AND DRAINAGE DAMAGES

ACE BASIN

Item	1972	1990	2020
Crop and Pastureland			
Problem area (acres)	310,300	406,700	478,000
Acres treated by going program	126,000	177,000	243,000
Acres remaining untreated	184,300	229,700	235,000
Annual damages ($) 1/	5,940,000	6,408,100	7,628,100
Forest Land			
Problem area (acres)	847,000	847,000	847,000
Acres treated by going program	381,000	421,000	502,000
Acres remaining untreated	466,000	426,100	345,000
Annual damages ($) 1/	5,544,000	4,473,000	3,685,000
Other Land			
Problem area (acres)	219,100	219,100	219,100
Acres treated by going program	162,000	173,500	193,000
Acres remaining untreated	57,100	45,600	26,100
Annual damages ($) 1/	2,112,000	2,052,000	1,435,500

1/ Estimated in 1975 dollars.

TABLE 5-6: NONAGRICULTURAL FLOODWATER DAMAGES

ACE BASIN

Item	1972	1990	2020
Homes and businesses in problem area (no.)	6,060	7,100	9,300
Homes and businesses protected by going programs (no.) (Flood insurance and community channel systems)	1,250	2,400	5,000
Homes and businesses remaining unprotected	4,810	4,700	4,300
Annual damages to unprotected property ($) 1/	962,000	940,000	860,000

1/ Estimated in 1975 dollars.

Roads and bridges are often damaged by floodwater.

Forest Fires

Wildfires, an ever-present menace to timber growth, account for three percent of total mortality in the basin's timber stands 1/. This represents a loss of 0.6 million cubic feet annually. Fires also burn off the organic material on the forest floor and open the mineral soil to erosive effects of rainfall.

During a ten year period, 1963-1972, an average of 1,701 fires burned over 22,868 acres annually. The average size of a fire during this period was 13 acres. Smoking, incendiarism and debris burning caused 88 percent of all wildfires in the basin. The South Carolina State Commission of Forestry has established an annual allowable burn of 5,300 acres, or 0.2 percent of the total commercial forest land in the basin.

The destructive effect of wildfires on timber and wildlife habitat are well known. A lesser known, but equally important, effect is air pollution. Burning of forest fuels releases carbon dioxide, carbon monoxide, hydrocarbons and particulate matter into the atmosphere. The combination of particulate matter and water vapor

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1/ U.S. Department of Agriculture, South Carolina Timber, 1968, Resource Bulletin SE-13, Table 22, Southeastern Forest Experiment Station, Asheville, North Carolina, 1969.

in the atmosphere produces smoke and smoke, as it reduces visibility, creates hazardous conditions for both air and surface transportation. In addition, the presence of particulate matter of five microns or less in the air can pose a threat to human health.

The South Carolina State Commission of Forestry maintains a fire-fighting organization to provide initial attacks on all wildfires. Forest industrial companies maintain fire-fighting forces to protect their respective timber holdings and to assist the state organization in fighting extremely large fires. Current funding of forest fire prevention programs is not enough to allow the State Commission of Forestry to keep wildfires under the allowable burn.

Forest Insects and Diseases

Insect and disease attacks reduce tree vigor, kill trees or reduce quality of wood to be used for high value products. According to the South Carolina State Commission of Forestry, 5.3 million cubic feet of timber are lost each year to insects and diseases. For the past two decades, the pine bark beetle has been responsible for a large part of this loss. Fusiform rust, a disease, is also a major contributor to loss of potentially usable pine wood fiber.

The South Carolina State Commission of Forestry maintains an insect and disease detection and evaluation program that employs both aerial and ground surveillance. The U.S. Forest Service provides back-up service when needed. Timber landowners are guided by the South Carolina State Commission of Forestry in detecting the major insect and disease attacks and also receive guidance in controlling any outbreaks. An average of $14,000 (both state and federal funds), is allotted annually by the South Carolina State Commission of Forestry for prevention, detection and evaluation work. Additional funds are available for special projects to suppress or control outbreaks such as the Southern Pine Beetle Control Program conducted from 1973 to 1976. The current allotment is not sufficient to reduce losses to a reasonable minimum.

Forest Resource Underutilization

Annual logging residue and wood waste in the basin amounts to a loss of 11.3 million cubic feet. Current technology points to a reasonable recovery rate of 9.5 million cubic feet at a cost of five cents per cubic foot. Effective employment of modern methods assumes overcoming traditional ways of logging and hauling, old customs that are responsible for a large part of the residue. Recovery of these losses cannot be achieved under present forest resource development programs.

Understocked Timber Stands

Timber stands in the basin (see Chapter 3) have a greater capacity for growing wood fiber than is now utilized under present practices. The current annual yield of 132 million cubic feet represents only 70 percent of the basin's potential growth rate of 188 million cubic feet. Improvement in growth rates can be achieved through a number of practices, but the major portion of additional

volume will be generated through employment of standard practices, e.g., reforestation and timber stand improvement.

There are 460,000 acres of forest land, classed either as non-stocked or poorly-stocked, on which complete reforestation is needed. In addition, idle land in the amount of 50,000 acres is suitable for reforestation. Because natural regeneration on harvested timber stands is not dependable, an additional acreage, estimated at five to ten thousand acres annually, should be reforested. The current rate of reforestation, 14,000 acres annually, is not sufficient to build up the potential production of forest land.

During a four year period (1972-1975), 44,698 acres were planted with nursery stock from both state nurseries and industrial nurseries. Of this total, 5,000 acres were planted with superior loblolly and slash pine seedlings produced by the state nurseries.

Overstocked Timber Stands

Timber stands that are overstocked or contain more than an acceptable number of rough and rotten trees are not fully utilized for maximum wood volume and/or for timber quality. The 1967 South Carolina Conservation Needs Inventory, estimates that one million acres of forest land in the basin are in need of some form of timber stand improvement. Present economic conditions (high labor and equipment costs) discourage many timber landowners from spending time and money on improvement work.

The South Carolina State Commission of Forestry, using both state and federal funds, provides forest management services to private landowners in all counties of the basin. These services include field assistance in timber stand improvement. During a ten year period (1963-1972), the Commission of Forestry field workers examined 5,424 timber tracts covering 731,210 acres. The average annual rate of timber stand inspections amounts to 500 separate tracts that contain 73,000 acres. It is estimated that timber stand improvement was recommended on 50 percent of the acreage examined. U.S. Department of Agriculture programs, namely the Forest Incentive Program (FIP) and the Agricultural Conservation Program (ACP) are also operating to encourage timber stand improvement work, but are not sufficiently funded to meet the needs. The current General Forestry Assistance program is not able to meet the demand for services directed at recovery of unused wood fiber.

Water Shortages

Shortages of surface water occur at unpredictable intervals. During the drought of 1954, many of the smaller streams dried up and the flow of larger streams was very low. Almost every year, there are periods of low rainfall which reduce water supplies for all uses. When droughts occur during the growing seasons, crop yields are reduced. Communities that depend on stream flow for their water supplies are forced to curtail the use of water for all but essential purposes. Communities that depend on wells for their supplies are usually able to find adequate supplies. As greater demands are

required of ground water sources, tapping of deeper aquifers is usually required. See Table 5-7 for estimated water requirements.

Water Distribution Systems in Rural Communities

At least 29 rural communities have shortages in their water distribution systems. Nine communities have no system(s) and 20 communities have areas not served, shortages of storage capacity, outdated treatment facilities or inadequate pressure for fire-fighting. If systems are not installed, the following are estimates of the number of people who will not be adequately served by community systems:

Item	1972	1990	2020
Population of communities with inadequate systems	107,270	117,000	136,000

Recreation

Shortages of recreation opportunities will continue to occur in the public sector if additional facilities are not provided. Increased population, hence, increased demands for recreational facilities will result in overuse of available resources and cause soil erosion, decreased water quality and damages to facilities.

The private sector is expected to provide most of the recreational opportunities for golfing, horseback riding, sports events, commercial attractions, hunting, fishing and beaches. The public sector will be expected to provide recreational opportunities usually found in public parks. Both the private and public sectors will be expected to provide swimming, camping, picnicking, boating, historical sites and other opportunities.

Rising prices in the private sector will place greater demands on the public sector to provide inexpensive recreation opportunities. Fifteen (15) public areas are now in use. An estimated 31 public areas will be needed to meet demands by 1990. This leaves a shortage of 16 public areas if no additional areas are provided. By the year 2020, a total of 39 public areas will be needed to meet estimated demands.

Sediment

Damages from sediment accumulation in the basin are minor compared to areas with more erosive soils. Due to the low gradient and the coarse nature of coastal plain sediments, suspended sediment concentrations are generally less than 50 milligrams per liter in streams. However, this frequently results in a heavy sand bedload and unstable channel beds, which is destructive to fish breeding habitat.

Although the main rivers are the points of greatest sediment deposition, small streams, especially in the upper counties, are damaged by sediment deposits. Sediment reduces stream capacities and prolongs flooding. Overbank deposition of sediment destroys

TABLE 5-7: WATER REQUIREMENTS

ACE BASIN

Item	1972	1990	2020
Municipal & Industrial Water			
Desired use (MGD)	72.4	87.7	113.2
Unfulfilled need (MGD)		15.3	40.8
Irrigation			
Desired use (acres)	10,000	22,000	36,000
Irrigated acres with going programs	5,000	12,000	16,000
Needed irrigated acres to satisfy desires	5,000	10,000	20,000

trees and other vegetation.

Due to sediment accumulation in the Atlantic Intracoastal Waterway, constant dredging must be done to keep the channel passable. Outlets of Rock Creek, Coosaw River, Ashepoo River, Dawho River and Edisto River have the greatest sediment accumulations.

Wind-blown sediment destroys seed beds and young plants during the late winter and early spring months. This sediment fills drainage and road ditches increasing maintenance costs. Problem areas occur in fields and ditches adjacent to the eroding identified in that section.

Most of the sediment reaching streams comes from eroding cropland.

Major sediment damage reduction results from erosion and flood control. All projects designed for erosion and flood control also reduce sediment damages. County sediment ordinances will help control sediment from construction sites. The only program specifically designed to reduce sediment damage is the dredging performed by the U.S. Army Corps of Engineers. The Corps has dredged about six million cubic feet of sediment from the Atlantic Intracoastal Waterway since 1956. This dredging covers an area from Charleston to Beaufort, excluding Charleston Harbor.

Without plan conditions show an increase in sediment in future time periods brought about primarily by increased crop production and all types of construction.

Water Pollution

The Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) require the elimination of point and non-point sources of pollution. Most of the larger urban areas are in the process of making adjustments to meet these requirements. Rural areas are just beginning to make plans for water treatment and will require financial assistance to meet the desired conditions.

Non-point source pollution is much more difficult to control and will remain a problem in the future. At present, both state and federal agencies are studying methods to measure and limit this pollution. If there is no further assistance from federal programs, progress in this area will be hampered. The basin's streams will continue to receive pollutants carried by runoff from agricultural and urban areas. Section 404, Public Law 92-500, places limitations on dredge and fill operations in waterways and associated lands. This could result in a significant reduction in sediment and other water pollutants.

Critically Eroding Areas

Critically eroding areas consist of severely eroding road areas, gullies and galled areas in fields. Erosion rates for critical areas are 20 or more tons per acre annually. (See Table 5-8.)

Mined Areas

Open mined areas that have not been reclaimed contribute sediment and other contaminants to lakes and streams. In addition, these areas are unsightly and unproductive. Future without conditions will be about the same as present conditions with 2,532 acres untreated.

Untreated mines are unproductive, unattractive and subject to erosion.

TABLE 5-8: CRITICALLY ERODING AREAS

ACE BASIN

Item	1972	1990	2020
	(Acres)		
Road areas	1,269	1,200	1,000
Gullies	113	100	100
Galled areas	614	620	600
Construction sites	2,000	3,000	4,000
TOTAL	3,996	4,920	5,700

Beach Erosion

Loss of beach area by day-to-day wave action and storm tides is a serious and ever-present problem. Eight areas with 111 miles of problem areas have been identified. Unless improved methods of treatment are developed, future conditions will remain the same as present.

The U.S. Army Corps of Engineers, Clemson University Extension Service, the South Carolina State Highway Department, county governments and private individuals are trying to prevent losses of beach areas. Some groins, riprap and beach nourishment are being tried, but success of these programs has been limited. Some of the beach erosion studies by the U.S. Army Corps of Engineers have concluded that treatment is not feasible at this time due to high costs and short life expectancy.

Controlling beach erosion is a tough problem.

Wildlife Resources

Suitable wildlife habitat will decrease in terms of acreage during both the periods from 1972-1990 and 1990-2020. Urban and built-up areas are expected to increase by 25,000 acres and 70,000 acres, respectively, during the two time frames. Possibly, an additional 10,000 acres adjacent to this new development will be disturbed by its proximity to that development. Of the acres to be newly developed, about 23,000 will come from agricultural land and 72,000 will come from forested areas.

Although agricultural acreage is expected to decrease, there

will be a trend to clear land in order to create larger, more efficient fields. This tends to reduce the proportion of field borders to the total area in those fields. Field borders satisfy an important habitat need for many upland species.

Freshwater Fishery Resources

The freshwater fishery habitat in the ACE Basin presently has quality and quantity adequate to meet the desires and needs of most of the public. Under the future conditions without a plan assumption, the development by 1990 of several problems can be projected.

Erosion and sediment will become an important threat to fishery habitat quality. Sediment both disturbs fish beds and carries with it pollutants which degrade water quality. The two most important sources of sediment are land development and agricultural tillage. Historically, communities in this area have been reluctant to adopt and implement sediment control rules. Little change in this trend is anticipated.

Encroachment by a growing population will tend to reduce the quantity of good fishery habitat. This will aggravate the sediment problem as well as increase the pollutants which are discharged through storm sewers or treatment plants.

The proliferation of certain weeds in lakes and ponds has become a nuisance to fishermen, as well as a detriment to fishery habitat. The trend of this problem is uncertain. Some varieties, such as the alligator weed, seem to have few, if any natural enemies. The assumption that research will continue even under conditions without a plan offers the possibility that the weed problem will be under control by 1990. It is felt that the public considers weed control to be a problem that needs attention.

Municipal and industrial wastes, as well as wastes from livestock operations are growing problems in respect to water quality and fishery habitat quality. However, strict controls were required by Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). Under current timetables, it is expected that wastes from these sources will be under control by 1990 as a result of the going programs. Expected increases of people and livestock will cause these problems to become a threat to water quality and fishery habitat quality if the going program fails.

Coastal and Estuarine Fishery Resources

Present rates of water pollution in the forms of municipal, industrial and livestock wastes, and sediment and agricultural chemicals are threatening the health of estuarine and coastal water ecosystems. Dredging and filling in order to create valuable resort property also causes imbalances in these areas.

The continuation of these problems would cause severe problems in these fishery habitats. It is projected that by 1990, a strong coastal management policy will be adopted by the State of South Carolina and most forms of municipal, industrial and livestock related pollutants will be under control. The critical problems remaining will be pollution from sediment and agricultural chemicals.

Threatened and Endangered Species

Numbers of threatened and endangered species will be further reduced if proper precautions are not taken. Timber harvesting operations could result in destruction of habitat for threatened and endangered species if these areas are not identified and preservation methods employed. The South Carolina Wildlife and Marine Resources Department and the Citadel are currently developing a list of sites where threatened and endangered species of plants and animals are found. Specific site selection will aid efforts to prevent destruction of the habitat of these species.

Wild and Scenic Rivers

At present, the basin is predominantly rural and most of the landscape is of high visual quality. As industrial and residential development continues, care must be taken to maintain this natural beauty.

The South Carolina Scenic Rivers Act of 1974 is a step in this direction. Under this Act, designated areas of rivers are declared "wild and scenic" rivers. Landowners can donate land by easement or deed to this program in exchange for tax advantages. The program is not successful at this time due to the small economic recompense. In the future, funds will be needed to purchase land from owners and to protect it once it is public property.

Visual Quality of Forest Stands

Appearance of the landscape changes when timber harvesting is carried out. These changes are especially noticeable when they are visible from scenic highways and from forest trails and overlooks. It is estimated that 25,000 acres of forest land are altered annually, either through timber harvesting or complete removal of all forest vegetation in highly visible areas.

Archeological and Historical Sites

Neglect of archeological and historical sites is causing deterioration of some sites, while others are destroyed by development.

The National Park Service is working with the South Carolina Department of Archives and History and the Institute of Archeology and Anthropology, University of South Carolina, to identify and preserve valuable sites. Continuation of these policies will insure protection of many sites.

CHAPTER 6 - NEEDS

Analysis of program outputs, agricultural production trends, population projections and other factors indicate that expected agricultural levels (OBERS) can be met under the future without plan conditions; however, some soil resources will be mined and overall production costs will be greater than if all land received adequate treatment. This chapter describes water and related land resource conservation and development needs. Component needs are defined as types, quantity and quality of desired effects. Needs are directed toward improvement in the quality of life of residents of the basin and are expressed as component needs of the national economic development (NED) objective and environmental quality (EQ) objective. Some needs are related to both the NED and the EQ objectives. The component needs are remaining needs for future time frames after going programs have contributed their share to problem solving. Simply stated, needs are problems less going programs. Component needs were identified through consultation with federal, state, regional and local groups. Component needs are the basis for plan formulation and will be used to compare the effectiveness of alternative plans. Table 6-1 shows a summary of needs for 1990 and 2020.

Needs Related to Economic Development

Economic development needs are identified as those that will increase outputs of goods and services and/or increase economic production efficiency. To meet expected future production levels in the basin, per acre yields as well as total acres harvested will be increased. The greatest increases are in forest products, soybean, corn and roughage production. Expected increased production will contribute to higher farm incomes. Other needs for solving problems that hinder economic development are identified.

Erosion Damage Reduction

The greatest need for erosion damage reduction is on cropland where sheet erosion is the major problem. Sheet erosion depletes the quality of the soil resource and results in lower yields and off-site damages from sediment. Even though erosion in forests and pastures is low, care should be taken when these areas are harvested, reforested, renovated or grazed. Erosion damage reduction needs relate to economic development because of the long term demands on the soil resource to

TABLE 6-1: SUMMARY OF NEEDS
1990 AND 2020
ACE BASIN

Component Need	Unit	Amount 1990	Amount 2020
Erosion Damage Reduction			
Cropland	Ac.	555,000	257,400
Pastureland	Ac.	57,700	144,700
Forest Land	Ac.	188,100	71,000
Floodwater Damage Reduction and Drainage on Agricultural and Forest Land			
Cropland and Pastureland	Ac.	229,700	235,000
Forest Land	Ac.	426,100	345,000
Other Agricultural Land	Ac.	45,600	26,100
Improved Production Efficiency			
Cropland	Ac.	198,600	120,000
Pastureland	Ac.	150,000	200,000
Forest Land	Ac.	2,032,400	1,700,000
Nonagricultural Floodwater Damage Reduction			
Communities	No.	78	78
Homes and Businesses	No.	4,700	4,300
Improved Water Supply and Distribution Systems			
Water Supply Requirements	MGD	15.3	40.8
Complete Distribution Systems	No.	9	9
Expanded Distribution Systems	No.	20	20
Irrigation	Ac.Ft.	10,000	20,000
Increased Public Recreational Areas	No.	16	24
Critical Erosion Damage Reduction			
Road Areas	Ac.	1,200	1,000
Gullies	Ac.	100	100
Construction Sites	Ac.	3,000	4,000
Galled Areas	Ac.	620	600
Old Mines	Ac.	2,532	2,532
Beaches	Mi.	25	25
Solid Waste Disposal Sites	No.	16	32
Waste Water Treatment Systems			
Complete System	No.	14	14
Expanded System	No.	37	37
Wild and Scenic Rivers	Mi.	226	277
Wildlife Area Improvement	Ac.	300,000	350,000
Fish Habitat Improvement	Ac.	2,000	4,000
Preservation of Habitat for Threatened and Endangered Species (Sites)	No.	10	10
Protection of Wetlands	Ac.	814,910	814,910

produce greater quantities of products.

Going land treatment programs are expected to provide protection for part of the land subject to erosion. By 1990, going programs are expected to provide treatment of 500,000 acres of cropland, 105,000 acres of pastureland and 2,400,000 acres of forest land. By 2020, going programs are expected to provide treatment of 550,000 acres of cropland, 195,000 acres of pastureland and 2,450,000 acres of forest land.

Floodwater Damage Reduction and Drainage on Agricultural and Forest Lands

Floodwater damage reduction and drainage needs are inseparable on most of the problem areas of the basin. The total area of wet soils in the basin is estimated to be 2,590,500 acres. Of this total, 815,000 acres are high value wetlands (See Table 2-10) and another 302,700 acres are not feasible to treat. This leaves a total of 1,472,800 acres that are feasible to treat. About 771,400 acres will have been treated by 1990. This results in a 1990 need of 701,400 acres. In future years, additional land will be used for crops and pastures, some of the present systems will deteriorate and the going programs will continue to provide protection. By 1990, the estimated need for treatment will be 701,400 acres and by 2020, the estimated need for treatment will be 606,100 acres.

About 230,000 acres of crop and pasture land needs protection from flooding and lack of drainage.

Increased Agricultural and Forestry Production Efficiency

If projected future demands for agricultural and forestry products are to be met, past trends in improving yields and adoption of better management practices must continue. Also, operators must be made aware of technology advances through information programs and they must be encouraged to use improved inputs and techniques as they become available.

Expected agricultural production in the future includes increased production from shifts of agricultural crops to more productive soils as well as bringing currently idle cropland and pastureland into production. Between 1972 and 2020, an expected 231,000 acres of new cropland will be added from idle land and clearing of some forest land. This points to a critical need to properly treat all land now in production as well as plan treatment programs for additions to the cropland base. Since almost all agricultural land will be needed by 2020 for production, it will not be possible to allow land to become so eroded or so wet through neglect that it becomes useless for production. Therefore, land treatment programs that will maintain future productivity of agricultural land as well as environmental protection are important for the agricultural sector.

Efficiency can also be increased by removing marginally productive land from crop production. These soils are usually Capability Classes IV through VII.

An ever increasing demand for wood fiber is expected for the next several decades. (See Chapter 4 for explanation.) Wood supply will eventually fall below quantity demand and, unless timber production is increased, it is inevitable that prices of wood and wood products will rise. This would lead to decreased demand until demand equalled available supply.

There are a number of opportunities to increase efficiency in wood fiber production. Reforestation of non-stocked and poorly-stocked forest land is a major opportunity. At the current rate of reforestation, it will take more than 40 years to restock more than one-half million acres.

Timber stand improvement, another important opportunity to increase supply of wood fiber, can be justified when applied to highly productive forest land. These forested areas with Site Classes 1, 2, 3 and 4 (upper one-third only) make a combined total of 410,400 acres.

Annual logging residue and wood waste in the basin amount to a loss of 11.3 million cubic feet. Current technology points to a reasonable recovery rate of 5.6 million cubic feet at a cost of five cents per cubic foot. Effective employment of modern methods assumes overcoming traditional ways of logging and hauling, old customs that are responsible for a large part of the residue.

Recovery of or reduction in timber volume losses caused by mortality offer opportunities for increasing wood fiber production. To reduce mortality caused by wildfires, federal funds allocated to the South Carolina State Commission of Forestry (currently $582,000), should be increased to a total of $998,000 annually. This will reduce fire losses below the annual allowable burn of 5,300 acres and save 5.3 million cubic feet annually. Reducing the wood volume lost to insect and disease attacks can help increase the amount of wood fiber reaching the market. The current annual allocation of $14,000 for

insect and disease control should be increased by $12,000 in order to recover 2.1 million cubic feet of wood.

Much wood fiber was left in this South Carolina woods by incomplete timber harvest. Improved utilization practices would recover large amounts of this kind of waste.
(Photograph courtesy of South Carolina State Commission of Forestry)

Nonagricultural Floodwater Damage Reduction

Of the 78 communities identified as having floodwater damages, six are in the regular flood insurance program, 27 are in the emergency flood insurance program, and 15 communities are not participating in the program but have been identified as having flood problems. Communities will continue to provide some flood protection through channel construction, even though this work is less effective when outlets are inadequate. A combination of channel construction, zoning, flood insurance, flood proofing and relocation is almost always needed.

Over 6,000 homes and businesses
are located in areas subject to flooding.

Improved Water Supplies and Water Distribution Systems

Communities that expect to expand their industrial base must have dependable water supplies. There must be a surplus supply of water to meet any emergency before an industry will locate in a community. Where ground water is the most practical source, additional wells will be needed. Muncipal and industrial demands for treated water are estimated to be 15.3 mgd in 1990 and 40.8 mgd by 2020.

In 1990, an estimated 22,000 acre feet of water will be needed to meet irrigation demands and by 2020, about 36,000 acre feet of water will be needed. Going programs will provide about 12,000 acre feet for irrigation in 1990 and 16,000 acre feet in 2020. This will result in a shortage of 10,000 acre feet in 1990 and 20,000 acre feet in 2020.

Nine communities need complete water distribution systems installed. At least 20 communities need improvements in their present systems. Table 6-2 shows a list of communities and their water distribution system needs. These estimates are based on reports by the councils of government and emphasis on higher standards for drinking water. No attempt is made to predict location of water-using industries, such as pulp and paper mills or textile finishing plants.

TABLE 6-2: WATER DISTRIBUTION SYSTEMS NEEDS

ACE BASIN

Region/County/Community	Install System	Increase Storage Capacity	Increase Treatment Capacity	Expand Service to Other Areas	Update Equipment
REGION 5					
Aiken					
Perry		x			
Allendale					
Allendale		x			x
Sycamore		x			x
Ulmers		x			
Bamberg					
Denmark				x	
Ehrhardt			x		x
Olar					x
Barnwell					
Barnwell				x	
Kline	x				
Orangeburg					
Bowman		x			
Cope	x				
Holly Hill		x			
North		x			x
Norway		x			x
Rowesville	x				
Woodford	x				
REGION 9					
Charleston					
Charleston			x		
Hollywood	x				
Dorchester					
Reesville	x				
Summerville				x	
St. George				x	
REGION 10					
Beaufort					
Bluffton	x				
Colleton					
Cottageville	x				
Edisto Beach				x	
Lodge					x
Hampton					
Furman					x
Luray					x
Scotia	x				
OTHERS					
Lexington					
Batesburg-Leesville			x		

Increased Public Recreational Opportunities

Needs for increasing recreational opportunities are estimated for the public sector only. There are presently 15 public areas that serve the basin's population. This includes state parks and other public areas. Several of the public areas are outside the hydrologic boundaries, but are within driving distance. Demands for public recreational facilities indicate that 31 public areas will be required by 1990 and 39 public areas by the year 2020. The difference in 1990 demands and the present supply indicates a need for 16 public areas. By 2020, the need will be 24 public areas if no areas are developed before that time.

Environmental Quality Needs

Environmental quality needs are those that conserve, protect or enhance areas of natural beauty, quality of water and land resources, biological resources and selected ecosystems and archeological and historical resources.

Protection and Improvement of Visual Quality

One of the region's major resources is its scenic value. In order to protect this resource, careful planning will be necessary. Certain areas of river systems with unique natural or scenic features should be protected. The South Carolina Wild and Scenic Rivers Act should be strengthened to provide an equitable means to compensate landowners for loss of rights when land is placed in the system.

Careful planning of timber harvests is needed to prevent impairment of the scenic beauty and wildlife value of forested areas.

Accelerated treatment is needed on 7,452 acres of critically eroding lands mostly in Aiken, Orangeburg, Calhoun and Bamberg Counties. This erosion is causing unsightly scars and gullies, and results in sediment deposits in the basin's lakes and streams.

Complete coverage of the basin with disposal systems is needed to prevent the dumping of trash along roadsides and in streams. Consideration of soil conditions will be necessary in order to properly locate landfill areas. Section 404, Public Law 92-500 should help reduce dumping of trash, especially in streams.

Improved Land and Water Quality

Although land and water quality throughout the basin is good, steps should be taken to maintain this condition in the future.

A major factor in the deterioration of both land and water quality is erosion. A large portion of the sediment deposited in streams, flood plains and estuaries results from cropland erosion and critical area erosion. An estimated 4,920 acres of critically eroding areas and 2,532 acres of mined areas will need to be treated by 1990. Sediment already deposited in streams should be removed where practical.

Water quality can be improved by reducing levels of water pollutants such as agricultural chemicals, nutrients and sediments

carried in runoff water and by controlling runoff from feedlots and urban areas before it reaches streams.

Wastewater treatment facilities and sewage collection systems need to be improved in at least 14 communities and an estimated 37 communities need to install waste treatment facilities and collection systems.

There is a continuing need for protection of beach areas from erosion, as well as a need for research to determine effective solutions to the problem. The following beach areas have the greatest need for erosion control measures: (1) Morris Island, (2) Folly Island, (3) Seabrook Island, (4) Botany Bay Island, (5) Edisto Island, (6) Hunting Island, (7) Bull Point and (8) Hilton Head Island.

Wildlife and Fishery Resources

As population increases create greater pressures on the land base, it will be necessary to take precautions to preserve wildlife habitat. Wildlife area improvement is needed on 300,000 acres and fishery habitat improvement on 2,000 acres. Protection of unique habitats, such as wetlands and estuaries, is of prime importance. A state-wide system is needed to identify and increase public interest in protecting the wetlands in the state. Enactment of the Coastal Zone Management Plan with adequate enforcement authority is needed to protect estuaries from pollution and encroachment. Water quality and quantity in streams and lakes also needs to be preserved to protect fishery habitat. Habitat necessary for the protection of threatened or endangered species should be identified and preserved. During planning of any project, studies should be made to determine possible effects on these species.

Marshlands need to be protected from encroachment and pollution.

Preservation of Archeological and Historical Sites

Heightened recognition and awareness of sites of archeological and historical value should be cultivated. There are more than 1,500 such sites which should be preserved. Site locations are not made public to prevent their destruction by unauthorized digging or removal.

An example of rural Victorian Italianate architecture.
Peoples Family Home, Varnville
(Photograph courtesy of Lowcountry Council of Governments)

CHAPTER 7 - ALTERNATIVE PLANS

Based on the component needs listed in the previous chapter, alternative plans have been developed which contribute to the well-being of the people living in the area. Two alternative plans that offer solutions to identified needs are discussed in this chapter. Alternative plans to meet only the 1990 needs are discussed. This 15-20 year time frame is referred to as the early action period. One alternative is designed to emphasize national economic development (NED) and one is designed to emphasize environmental quality (EQ). Projections of production demands, population changes, soil erosion, changes in life styles and other factors were used in the preparation of alternatives. Alternatives are used to compare effects of different levels of development on production and income in the basin.

The beneficial and adverse effects of each alternative plan have been evaluated and displayed for the four accounts: National Economic Development, Regional Development, Environmental Quality and Social Well-Being. The identification of effects from various elements are presented in monetary and/or non-monetary terms. An element or measure may accrue effects to more than one account.

Alternatives for meeting needs were made with participation by groups and individuals throughout the basin. Personal contacts were made with councils of government, soil and water conservation districts, special interest groups, officials of all levels of government and individuals. All groups were found to be interested in economic development and protection of the environment, even though means of accomplishing these objectives often differ. A questionnaire was used to broaden the participation within the basin. Comments received influenced the types of measures included in the alternative plans. See Table 7-1 for the two alternative plans.

National Economic Development Alternative

The national economic development objective is to increase the value of the nation's output of goods and services and to improve national economic efficiency. Components of the objective are designed to increase the value of the nation's output of goods and services, required to meet existing and projected demands and to increase the value of output resulting from external economies. Included in the national economic development plan are environmental quality components that will contribute to economic development or will make the economic development components acceptable to society.

TABLE 7-1: ALTERNATIVE PLANS FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	NED Alternative Amount	NED Alternative Cost ($)	EQ Alternative Amount	EQ Alternative Cost ($)
Erosion Damage Reduction and Increased Production Efficiency								
Cropland	Ac.	753,600						
			A. Terraces & waterways	Ac.	27,000	1,080,000	12,000	480,000
			B. Waterways & contour farming	Ac.	95,400	1,192,500	50,000	625,000
			C. Minimum tillage	Ac.	35,000	525,000	324,000	4,860,000
			D. Grass based rotations	Ac.	4,000	120,000	4,000	120,000
			E. Wind erosion control	Ac.	10,000	300,000	14,000	420,000
			Irrigation	Ac.	10,000	100,000	10,000	100,000
			Shift from forest to crops	Ac.	59,400	4,455,000	95,900	7,192,000
Pastureland	Ac.	207,700						
			Pasture & hayland planting	Ac.	85,000	3,400,000	80,000	3,200,000
			Improved management	Ac.	140,000	1,400,000	130,000	1,300,000
			Ponds	No.	200	800,000	200	800,000
Forest land	Ac.	2,220,500						
			Reforestation	Ac.	213,600	5,874,000	73,300	2,007,500
			Timber stand improvement	Ac.	410,400	14,350,000	-	-
			Improved utilization and marketing	Cu.Ft.	205,600,000	10,280,000	-	-
			Prescribed burning	Ac.	500,000	1,250,000	500,000	1,250,000
			Mortality reduction	Cu.Ft.	7,400,000	3,700,000	1,800,000	90,000
			Fertilization	Ac.	300,000	18,600,000	-	-
			Improved logging roads and skid trails	Mi.	-	-	100	10,000

TABLE 7-1: ALTERNATIVE PLANS FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	NED Alternative Amount	NED Alternative Cost ($)	EQ Alternative Amount	EQ Alternative Cost ($)
Floodwater Damage Reduction and Drainage on Agricultural and Forest Land	Ac.	701,400						
			Major outlet channels	Mi.	1,480	25,513,000	660	11,484,000
			On-farm systems:					
			cropland	Ac.	195,700	22,726,000	58,200	6,751,000
			pastureland	Ac.	21,800	1,603,000	8,700	644,000
			forest land	Ac.	200,000	10,873,000	50,000	2,750,000
			other land	Ac.	22,500	1,850,000	16,100	1,476,000
Nonagricultural Floodwater Damage Reduction								
Communities	No.	78						
Homes & businesses	No.	4,700						
			Flood proofing or relocating homes	No.	360	1,125,000	500	1,563,000
			Outlet channels	Mi.	147	2,832,000	100	1,955,000
Improved Water Supply and Distribution Systems								
Water supply	MGD	15.3						
Complete distribution systems	No.	9						
Expanded distribution systems	No.	20						
			Wells	MGD	15.3		15.3	
			Distribution systems	No.	29	45,750,000	29	45,750,000
Irrigation	Ac.Ft.	10,000						
			Ponds	No.	400		400	
				Ac.Ft.	10,000	1,600,000	10,000	1,600,000

TABLE 7-1: ALTERNATIVE PLANS FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	NED Alternative Amount	NED Alternative Cost ($)	EQ Alternative Amount	EQ Alternative Cost ($)
Increased Public Recreational Areas	No.	16						
			Public areas	No.	16	40,371,000	16	40,371,000
			Forest multiple use (for recreation)	Ac.	-	-	3,000	21,000
Critical Erosion Damage Reduction								
Road areas	Ac.	1,200	Treatment of road areas	Ac.	-	-	1,150	230,000
Gullies	Ac.	100	Treatment of gullied areas	Ac.	-	-	100	80,000
Construction sites	Ac.	3,000	Treatment of construction sites	Ac.	-	-	3,000	1,200,000
Galled areas	Ac.	620	Treatment of galled areas	Ac.	-	-	610	305,000
Old mines	Ac.	2,532	Treatment of old mines	Ac.	-	-	2,100	210,000
Beaches	No.	8	Treatment of beaches	No.	-	-	8	
	Mi.	25		Mi.	-	-	25	500,000
Solid Waste Disposal Areas	No.	16		No.			16	not evaluated
Wastewater Treatment Systems								
Complete systems	No.	14						
Expanded systems	No.	37						
			Install systems	No.	-	-	51	60,000,000
Improvement of Natural Beauty	Ac.	70,000						
			Wild & scenic rivers	Mi.	-	-	226	not evaluated
			Maintain maximum forest cover	Ac.	-	-	50,000	50,000
			Reduce wild fires	Ac.	-	-	17,600	688,000

TABLE 7-1: ALTERNATIVE PLANS FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	NED Alternative Amount	NED Alternative Cost ($)	EQ Alternative Amount	EQ Alternative Cost ($)
Wildlife Area Improvement	Ac.	300,000						
			Wildlife area & field border plantings	Ac.	-	-	10,000	300,000
			Modified silvicultural practices	Ac.	-	-	30,000	300,000
			Maintenance of hardwood timber types	Ac.	-	-	200,000	600,000
Fish Habitat Improvement	Ac.	2,000						
			Pond construction	No.	-	-	100	450,000
			Fish pond improvement	Ac.	-	-	2,000	40,000
Preservation of Habitat for Threatened and Endangered Species (Sites)	No.	10						
			Site identification & selection	No.	-	-	10	not evaluated
Protection of Wetlands	Ac.	814,910						
			Wetlands	Ac.	-	-	814,910	not evaluated
Protection of Archeological and Historical Sites	No.	1,528						
			Site protection	No.	-	-	1,528	not evaluated

Measures are classified into three groups: nonstructural measures, land treatment measures and structural measures. Some measures could be classified into more than one of these groups.

Nonstructural

Flood Proofing and Relocation: Plans for floodwater damage reduction usually include a combination of treatments such as zoning, relocation, flood hazard analysis, flood proofing, flood insurance, flood plain management and channel work. Going programs already include flood insurance and some land use regulations within flood plains. Channel work is discussed under the "Structural Plan" in this chapter. An estimated 360 homes and businesses will be flood proofed or relocated during the early action period. Costs are estimated at $1,125,000.

Land Treatment, Cropland and Grassland: Land treatment practices will be applied to decrease erosion and improve production efficiency.

Agricultural production will increase to meet the basin's share of the nation's future requirements for food and fiber. Major increases in demands of the basin are in the production of soybeans, corn and roughage. Increased production places greater demands on land and water resources. Plans include means for protecting these resources for sustained production over an indefinite time period. Generally, measures that improve agricultural efficiency also decrease soil erosion. The primary analysis of improved agricultural efficiency is based on reduced production costs per unit of production through proper land treatment and management practices, but other important national considerations include more efficient use of fertilizers and chemicals and savings in energy consumption.

The national economic development alternative includes a land treatment plan that will improve the economic efficiency of agricultural production in the basin. A summary of the land treatment program proposed to improve economic efficiency is presented in Table 7-2. Accompanying land use associated with the national economic development alternative is shown in Table 7-3. Implementation of the national economic development alternative for agriculture would result in efficiency gains of $3,101,000 over the production cost of the same level of agricultural output under the without plan conditions described in Chapter 5. Expected agricultural production under these conditions is shown in Table 7-4.

The greatest need for erosion control and sediment reduction is on cropland where sheet erosion occurs. Treatment includes practices that will reduce erosion and improve production efficiency. Land use adjustments include less intensive use of erosive soils and more intensive use of the flatter less erosive soils. Most of the land in Classes IVe, IVs and VIe, now in crops, will be converted to grasses or trees. Some land, now in forest, will be cleared for crops. Practices such as chiseling, bedding, minimum tillage, crop residue management, contour farming, field borders, surface and subsurface drains, land leveling, conventional or parallel terraces and conservation cropping systems serve all of the intended purposes of land treatment. They improve crop yields in the short run and help to insure the future productivity of the soil.

TABLE 7-2: TREATMENT OF CROP AND PASTURE LAND
NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

ACE BASIN

Region/Treatment	Amount ---(Acres)---
REGION 5	
Flood Damage Reduction and Drainage	50,900
Erosion Control and Sediment Reduction	139,700
REGION 9	
Flood Damage Reduction and Drainage	54,700
Erosion Control and Sediment Reduction	11,700
REGION 10	
Flood Damage Reduction and Drainage	111,900
Erosion Control and Sediment Reduction	20,000
TOTAL	
Flood Damage Reduction and Drainage	217,500
Erosion Control and Sediment Reduction	171,400

TABLE 7-3: LAND USE AND EROSION RATES
NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

ACE BASIN

Land Use and Erosion Rates	Amount
Planted cropland (acres)	769,600
Erosion rate (tons/acres)	6.4
Hayland and pasture (acres)	163,200
Erosion rate (tons/acres)	0.2
Idle cropland (acres)	178,600
Erosion rate (tons/acres)	0.4
Forest converted to cropland (acres)	59,400
Pasture converted to forest (acres)	81,000

TABLE 7-4: CROPS, TOTAL PRODUCTION, ACREAGE AND YIELDS PER ACRE
NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

ACE BASIN

Commodity	Production	Acreage	Average Yield/Acre
Cotton	8,340,000 lbs.	16,300	511.6 lbs.
Corn	10,740,000 bu.	150,200	71.5 bu.
Wheat	728,000 bu.	17,300	42.1 bu.
Oats	691,000 bu.	12,800	54.0 bu.
Barley	770,000 bu.	14,600	52.7 bu.
Roughage	358,000 tons	163,200	2.2 tons
Sorghum	12,000 bu.	300	40.0 bu.
Soybeans	14,088,000 bu.	472,400	29.8 bu.
Tobacco	1,740,000 lbs.	700	2,485.7 lbs.
Peanuts	14,000,000 lbs.	5,200	2,692.3 lbs.
Peaches	362,000 bu.	2,100	172.5 bu.
Tomatoes	31,000 tons	5,600	5.6 tons
Crop Failure		30,200	
Minor Crops		41,900	
Total		932,800	

Vegetation is the best protection for sand dunes along the beaches.

Treatment of cropland is usually accomplished by application of a combination of practices referred to as systems in this report. The major systems for treating cropland are as follows:

System A includes grassed waterways or closed drains, bedding, terraces, contour farming, crop rotations and field borders.

System B includes grassed waterways, crop rotations, contour farming and field borders.

System C includes minimum tillage, contour farming, crop rotations and field borders.

System D includes grass based rotations, contour farming and field borders.

System E includes windbreaks, chiseling and crop rotations.

Treatment of grassland includes planting improved grasses and legumes, such as coastal bermuda grass, bahia grass, lespedeza sericea, fescue and others as are adapted to individual soils.

Management includes annual fertilization and liming, weed control and grazing management. Generally, pastures are planned on soils with higher hazards such as steeper slopes and wetter conditions. Livestock watering ponds will be located to avoid, as much as possible, erosion caused by livestock movement and to improve forage utilization.

Land Treatment, Forest Land: Forest resources development is centered on reducing the deficit of wood fiber supply that is projected (see Chapter 4) for the future, beginning in the early 1980's. Measures proposed for the national economic development plan, if carried out, can increase wood supplies sufficient to meet demands well into the 1990's. By the decade 2020, accelerated programs will have increased normal production by 30.7 million cubic feet annually. This additional volume will have narrowed the gap and quantity supplied will be within 92 percent of quantity demanded. Without program development, the supply would be only 77 percent of the quantity demanded.

In general, the national economic development plan attempts to meet demands by improving stocking of existing commercial forest stands and by reducing waste of wood fiber that occurs under current harvesting and marketing practices. Restocking, or reforestation, of commercial forest land includes both pine stands and hardwood stands. Measures recommended to reduce waste include harvesting of large numbers of trees not now utilized and removal of portions of harvested trees now left in the woods.

Structural

Structural measures are planned to meet needs which nonstructural measures cannot satisfy. Often combinations of nonstructural and structural measures are necessary to solve problems and meet needs.

Channel Work: Channel work for flood control and drainage often serves agricultural and built-up areas. For this analysis, two types of channels are described. First, agricultural outlet channels are major outlets and provide benefits to groups of people. Secondly, non-agricultural outlet channels are designed for flood control in built-up areas.

Agricultural and forestry floodwater damage reduction and drainage plans include 1,480 miles of multiple purpose community channels. These channels will cost about $25,513,000, which includes $20,700,000 for construction, $1,181,000 for engineering services and $3,632,000 for land rights. Closely associated with major outlet channels are on-farm systems of open and closed drains that serve as pick-up systems for transporting water to the main outlets. Figure 7-1 shows the general location of areas expected to be served by major agricultural outlets.

Floodwater damage reduction in built-up areas is often associated with systems planned for both agricultural and built-up areas. Plans include the installation of 147 miles of outlet channels to serve 48 areas in the basin. (See Figure 7-2.) This work will cost about $2,832,000 and will benefit more than 1,080 homes. Operation and maintenance costs are expected to be $240,000 annually.

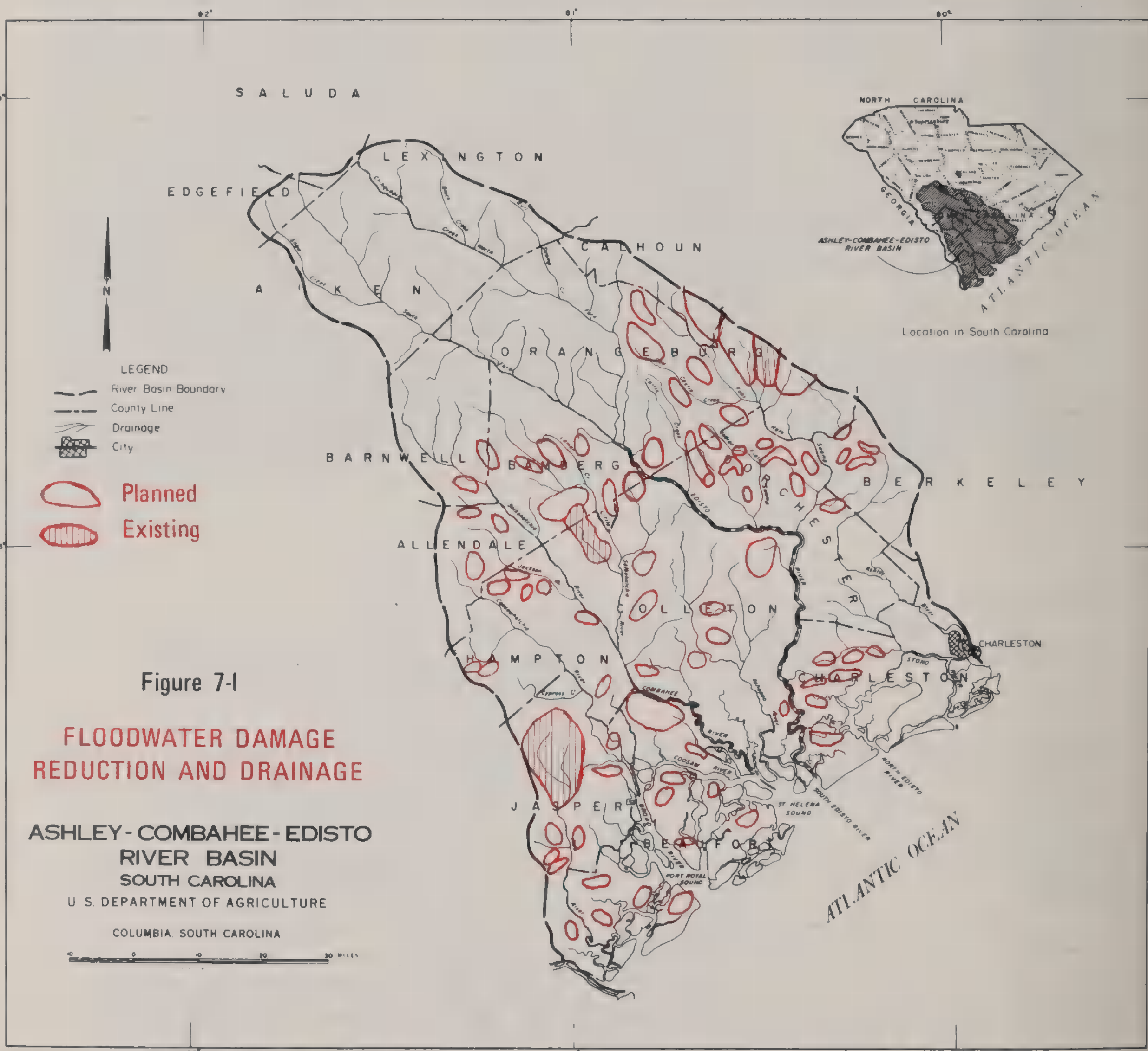

Figure 7-1

FLOODWATER DAMAGE REDUCTION AND DRAINAGE

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

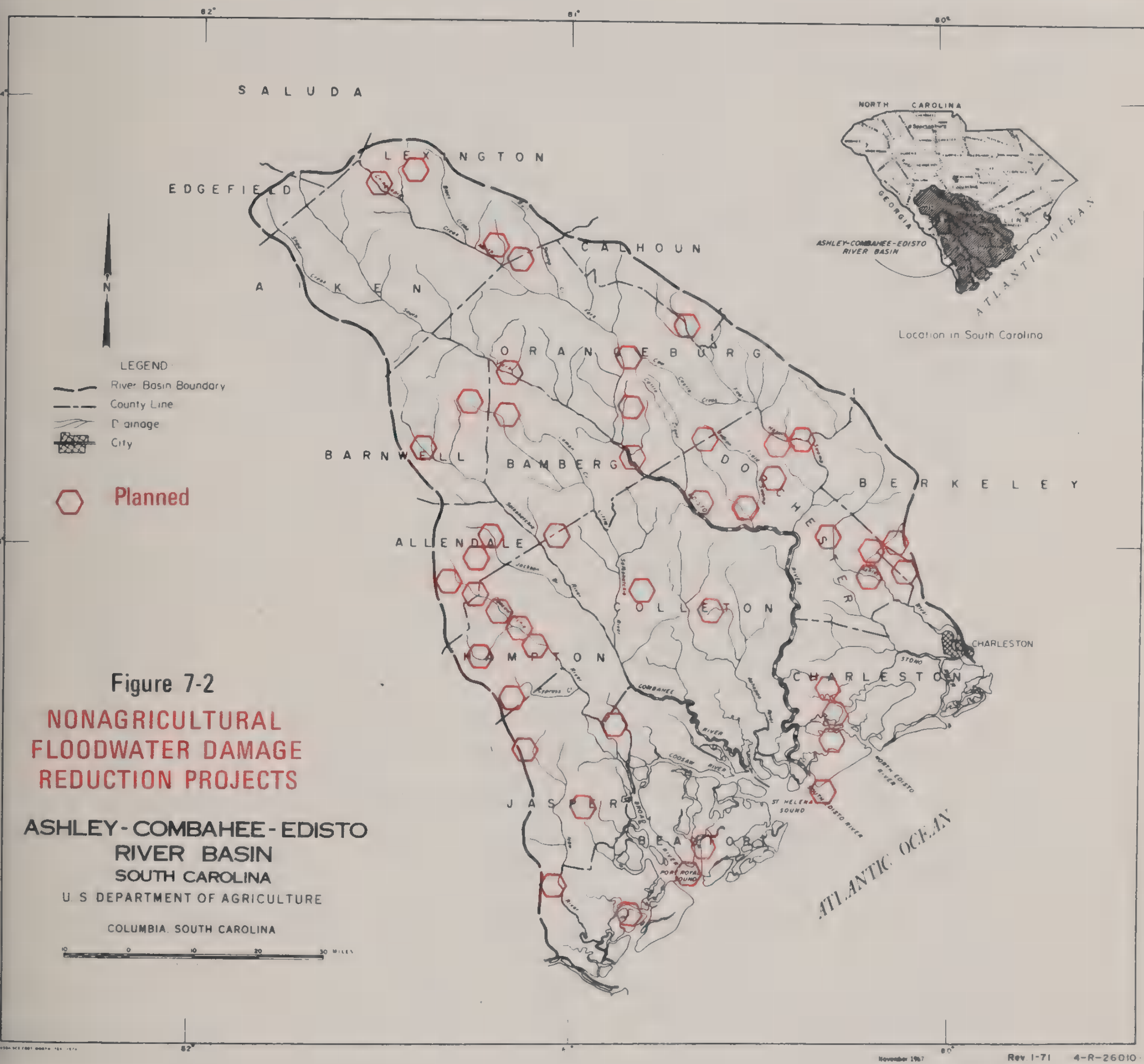

Figure 7-2
NONAGRICULTURAL FLOODWATER DAMAGE REDUCTION PROJECTS

ASHLEY - COMBAHEE - EDISTO RIVER BASIN
SOUTH CAROLINA
U S DEPARTMENT OF AGRICULTURE
COLUMBIA, SOUTH CAROLINA

Water Supply and Distribution Systems: Water supplies for most of the smaller communities in the basin will be furnished from ground water. Although the potential supply seems to be adequate for the early action time period, water distribution systems will be installed in several areas. These systems include distribution pipes, fire hydrants, homes and business water taps and storage tanks. Areas with existing systems will be enlarged or expanded to serve the growing population. Twenty-nine communities will install or expand their water distribution systems. Large centers such as Charleston, Beaufort, Orangeburg and Aiken use surface water sources and will expand them as demands increase. Installation and development of these systems is expected to cost $45,750,000. (See Figure 7-3.)

Recreation Development: Plans for recreation development by the public sector include 16 public areas developed by the state or by the U.S. Forest Service. These areas are estimated to cost $40,371,000 and includes $11,644,000 for land, $28,096,000 for construction and $631,000 for engineering services. Operation, maintenance and replacement are expected to cost $1,403,000 annually. Benefits that will accrue from the use of these public areas are expected to be 2,172,000 visitor days annually valued at $1.80 per visitor day.

The 16 proposed areas for public development are shown in Figure 7-4 and are as follows:

District Park (Aiken County)

District Park (Jasper County)

District Park (Beaufort County)
Preference: in vicinity of Port Royal Sound

Two District Parks (Charleston County)
Preference: Atlantic Ocean frontage

Patriot's Point District, Cultural and Leisure Industry Park (Charleston County)
On Hog Island in Charleston Harbor

Drayton Hall District and Historic Park (Charleston County)

Buck Hall District Park (Charleston County)
In Francis Marion National Forest

Huger District Park (Berkeley County)
In Francis Marion National Forest

Pleasant Hill District Park (Berkeley County)
In Francis Marion National Forest

Laurel Hill District Park (Berkeley County)
In Francis Marion National Forest

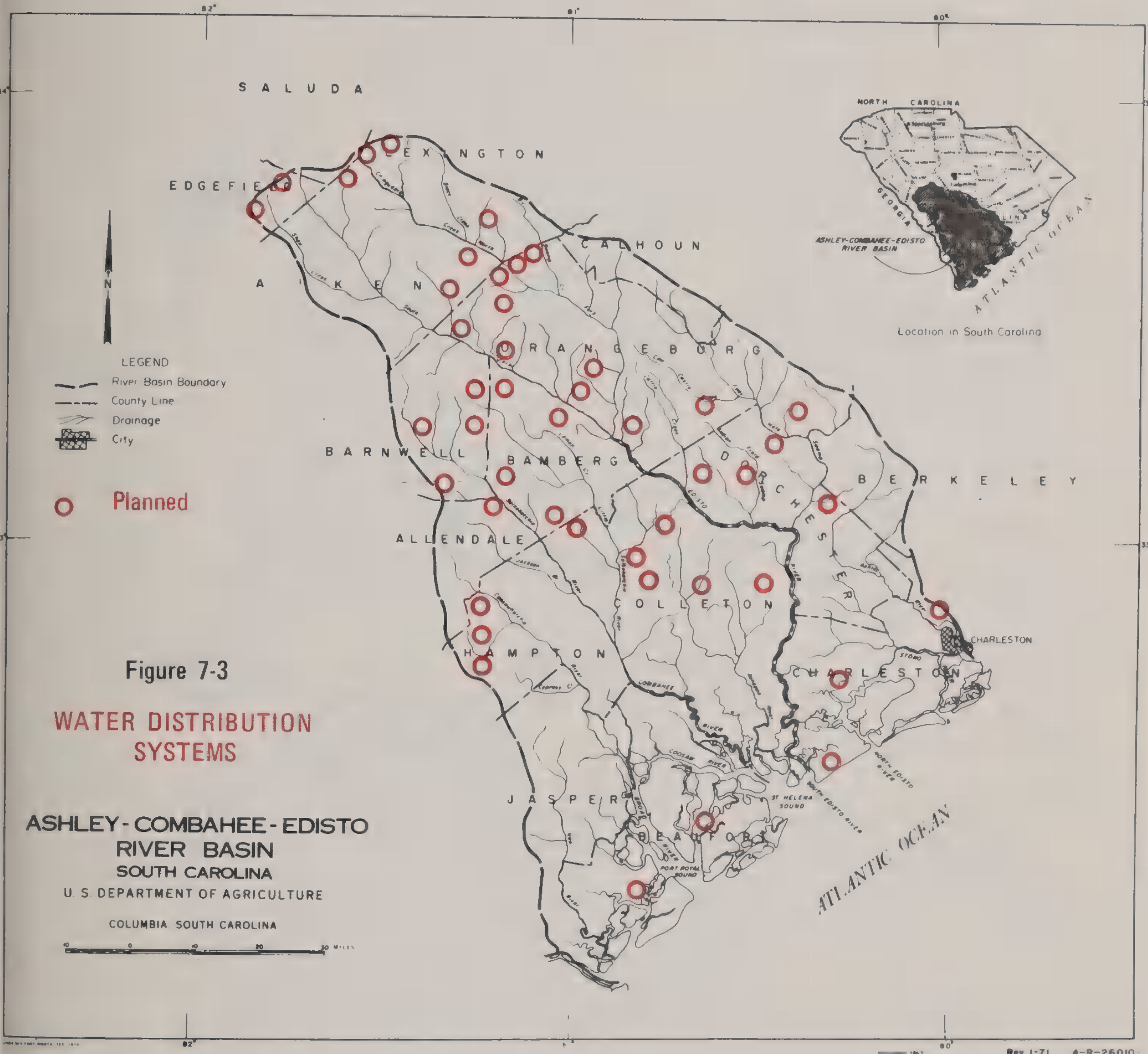

Figure 7-3

WATER DISTRIBUTION SYSTEMS

ASHLEY - COMBAHEE - EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
COLUMBIA, SOUTH CAROLINA

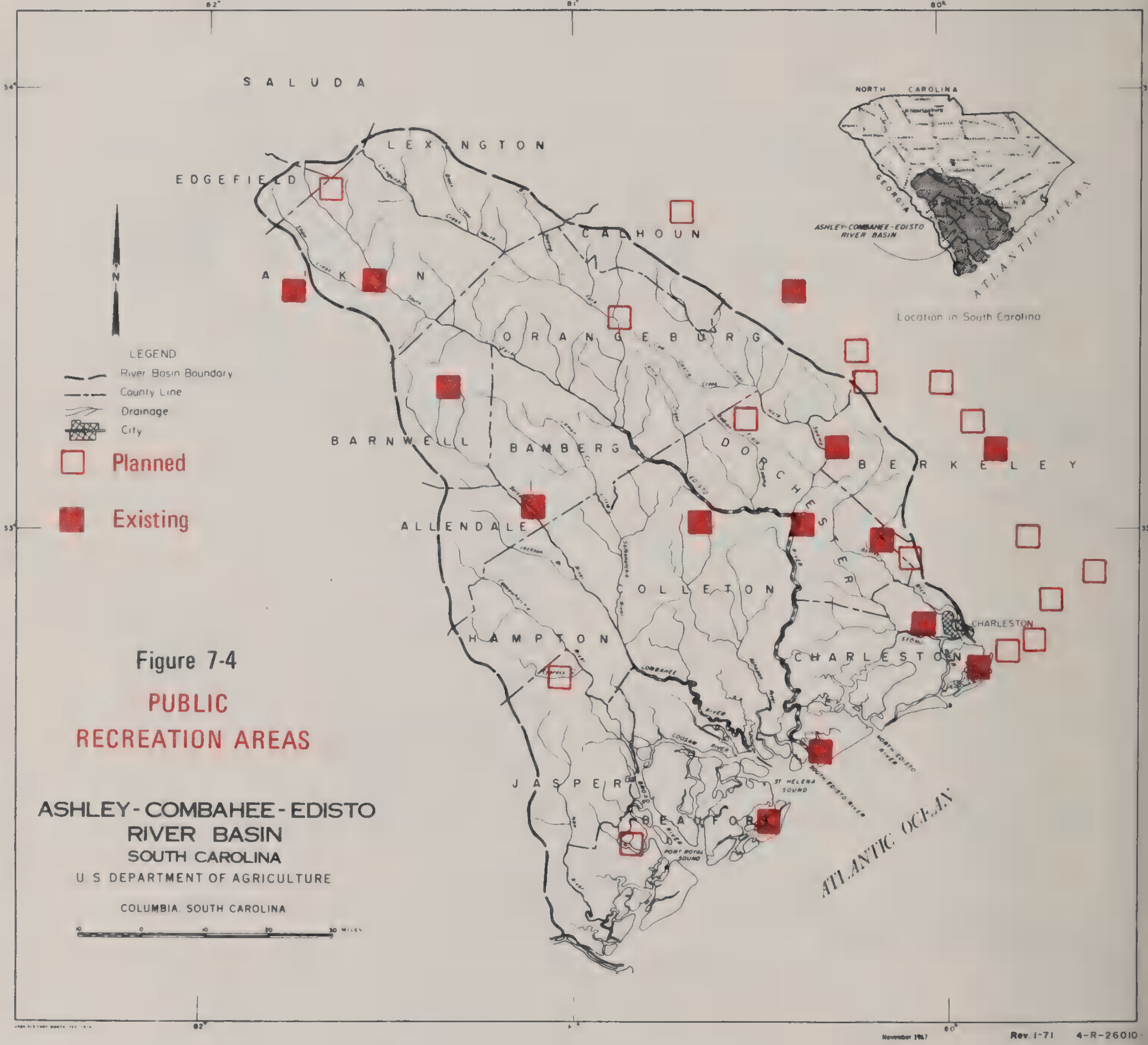

Figure 7-4

PUBLIC RECREATION AREAS

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U S DEPARTMENT OF AGRICULTURE
COLUMBIA, SOUTH CAROLINA

District Park (Berkeley County)
Preference: on Lake Moultrie

Dorchester North District Park (Dorchester County)

Lake Moultrie Destination Park (Berkeley County)
Lake Moultrie and Lake Marion

Regional Park (Calhoun County)
Preference: border Lake Santee

Orangeburg District Park (Orangeburg County)

Environmental Quality Alternative

The environmental quality objective is to manage, conserve, preserve, create, restore or improve the quality of natural and cultural resources and ecological systems.

Components of the environmental quality objective include:

1. Management, protection, enhancement or creation of areas of natural beauty and human enjoyment, such as open and green space, streams and river systems, lakes and reservoirs, beaches, shores, wetlands and estuaries.

2. Management, preservation or enhancement of especially valuable or outstanding biological resources and ecosystems.

3. Management, preservation or enhancement of especially valuable or unique geological, archeological and historical resources.

4. Enhancement of quality aspects of water and land by control of pollution, prevention of erosion and restoration of eroded areas in order to harmonize land use objectives in terms of productivity for economic use and development with conservation of the resources.

5. Careful evaluation of irreversible or irretrievable commitments of resources.

The environmental quality alternative is designed to emphasize the components listed above. The environmental quality alternative is also expected to be a viable plan that could be implemented if sponsoring organizations were willing to commit required resources. Some elements of the environmental quality alternative are the same

as those in the national economic development alternative, other elements are altered to decrease adverse environmental impacts and elements that serve only the environmental quality objectives are added.

Nonstructural

The environmental quality alternative places more emphasis on preservation of environmental values than does the national economic development alternative. Along with flood hazard analysis and land use regulations, floodwater damages could be reduced by flood proofing of buildings and relocating homes and businesses out of flood prone areas.

Greater emphasis is placed on protection of high value wetlands. All of the wetland Types 3 through 20 should be protected through efforts of individuals, organizations and agencies of government.

Archeological and historical sites are continually being reported. The environmental quality alternative includes all of the sites already located. These sites should be protected from destruction.

The environmental quality alternative includes land acquisition, as well as free easements to strengthen the state Wild and Scenic River System. Additional funds from the state or interested organizations could improve this program. Figure 7-5 shows potential wild and scenic rivers in the basin.

Threatened and endangered species of animals have been identified in the basin. Habitat is often critical to the survival of these species. At least 10 of these sites are included for identification and preservation.

Additional sites should be developed for solid waste disposal. In order to avoid water quality problems, careful consideration will be given to soils when locating landfill areas.

Livestock waste lagoons help nature improve water quality.

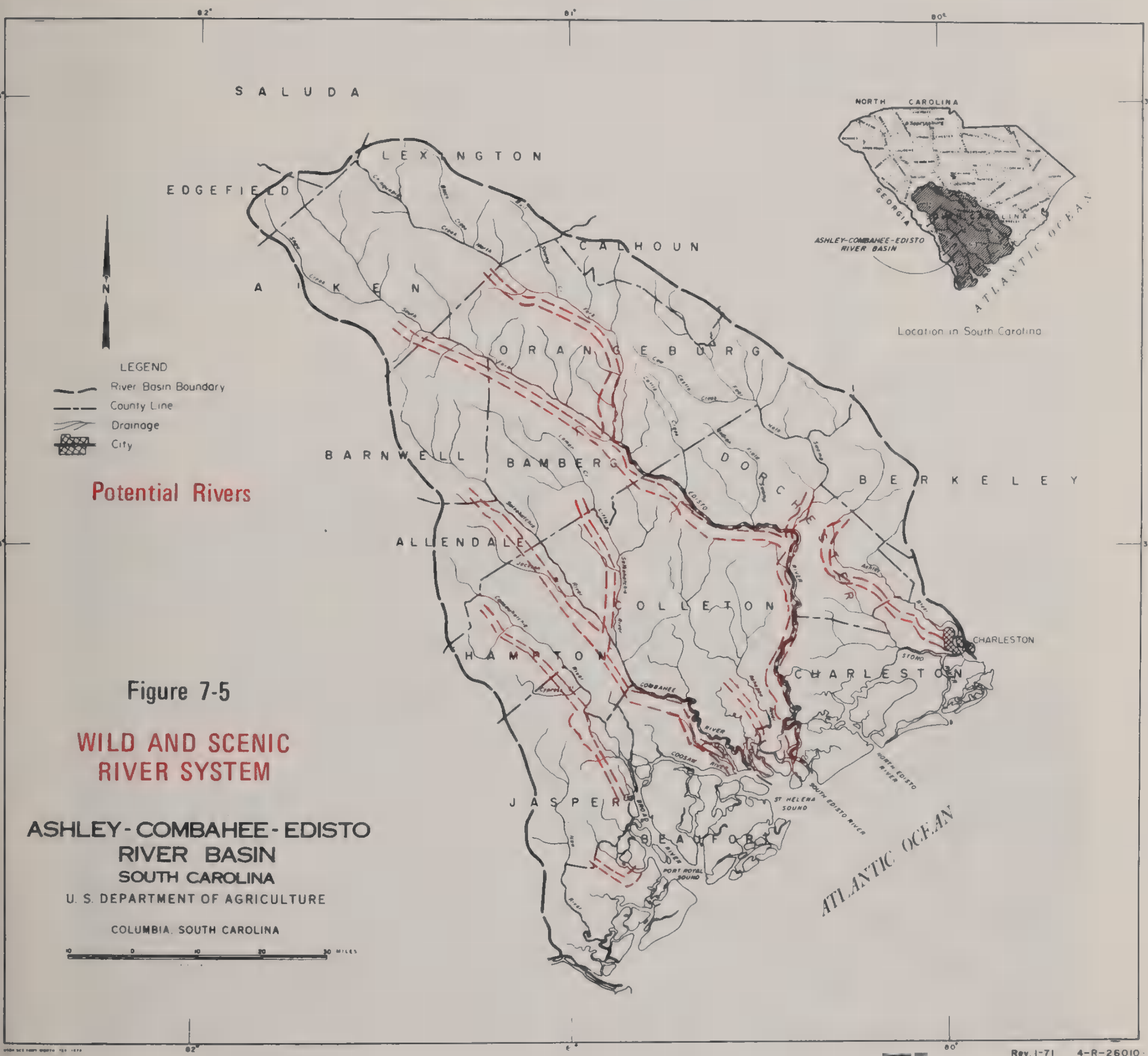

Figure 7-5

WILD AND SCENIC RIVER SYSTEM

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA, SOUTH CAROLINA

Old rice fields will be protected and maintained for waterfowl habitat.

Land Treatment, Cropland and Grassland: Land treatment plans in the environmental quality alternative are designed to reduce sediment resulting from soil erosion, improvement in water quality, protection of land resources and improvement in wildlife habitat. Other objectives are sustained crop production to meet the food and fiber requirements of the basin. The major increases are expected to be in the production of soybeans, corn and roughage.

Erosion from cropland is one of the main targets of the environmental quality alternative. Accelerated treatment of critically eroding areas is also emphasized. Land treatment for improved production efficiency is included. Land treatment systems, as described in the national economic development alternative, are used in the environmental quality alternative.

Establishment of grass and improvement of grassland cover are focused on reduction of erosion and sediment as well as forage production. Some of the more erosive soils will be planted to grass.

Small grain strips help protect young crops from wind erosion.

The environmental quality alternative assumes a land treatment program for agricultural land that will reduce the present levels of erosion and maintain the long term productivity of agricultural land. The basin's share of the total state agricultural production is different under the environmental quality alternative and the national economic development alternative. This results in additional differences in production levels, average yields and efficiency gains

between the two alternatives. A summary of the land treatment program is given in Table 7-5. Expected agricultural production under these conditions is presented in Table 7-6. A summary of the land use and erosion rates under environmental quality conditions is shown in Table 7-7. In addition to a reduction of 3,010,000 tons of soil each year, implementation of the environmental quality alternative would result in efficiency gains of $2,909,000 over the without plan conditions described in Chapter 5. It should be noted that to reduce erosion levels to the point that long term productivity can be maintained, a larger area of forest land (on level soils) would have to be cleared for crop production. Additional hay and pasture would then be grown on the more erosive soils, while the most erosive soils would become idle.

Reducing erosion to a level which would maintain soil productivity would require a large increase in the amount of minimum tillage cultivation for soybeans and corn. Total acreage under minimum tillage cultivation would have to increase from an expected total of 157,000 acres under the without plan conditions to 481,000 acres under the environmental quality alternative.

Land Treatment, Forest Land: Erosion practices include treatment and revegetation of logging roads and loading decks. This work will be done as soon as logging operations are complete. When trees are planted on areas subject to erosion, mulching, diversions or other practices will be employed to hasten establishment of the trees. On erosive soils, special care will be taken to avoid soil disturbances as much as possible. In some stands, trees will be harvested in strips allowing only a limited area to be exposed at any given time.

Rapid reforestation following harvesting or replanting of poorly-stocked or non-stocked forest lands must be carried out to keep South Carolina timber stands fully productive.
(Photograph courtesy of South Carolina State Commission of Forestry)

TABLE 7-5: TREATMENT OF CROP AND PASTURE LAND
ENVIRONMENTAL QUALITY ALTERNATIVE

ACE BASIN

Region/Treatment	Amount
	---(Acres)---
REGION 5	
Flood Damage Reduction and Drainage	15,800
Erosion Control and Sediment Reduction	275,800
REGION 9	
Flood Damage Reduction and Drainage	15,800
Erosion Control and Sediment Reduction	34,000
REGION 10	
Flood Damage Reduction and Drainage	35,300
Erosion Control and Sediment Reduction	65,000
TOTAL	
Flood Damage Reduction and Drainage	66,900
Erosion Control and Sediment Reduction	374,800

TABLE 7-6: CROPS, TOTAL PRODUCTION, ACREAGE AND YIELDS PER ACRE ENVIRONMENTAL QUALITY ALTERNATIVE

ACE BASIN

Commodity	Production	Acreage	Average Yield/Acre
Cotton	10,394,000 lbs.	20,200	514.5 lbs.
Corn	10,960,000 bu.	141,700	77.3 bu.
Wheat	643,000 bu.	15,200	42.4 bu.
Oats	691,000 bu.	12,700	54.4 bu.
Barley	483,000 bu.	8,600	56.1 bu.
Roughage	358,000 tons	171,000	2.1 tons
Sorghum	18,000 bu.	400	47.0 bu.
Soybeans	14,506,000 bu.	480,400	30.2 bu.
Tobacco	1,740,000 lbs.	700	2,600.9 lbs.
Peanuts	6,100,000 lbs.	2,300	2,699.1 lbs.
Peaches	362,000 bu.	2,100	172.5 bu.
Tomatoes	31,000 tons	5,600	5.6 tons
Crop Failure		30,200	
Minor Crops		41,900	
Total		933,000	

TABLE 7-7: LAND USE AND EROSION RATES
ENVIRONMENTAL QUALITY ALTERNATIVE

ACE BASIN

Land Use and Erosion Rates	Amount
Planted cropland (acres)	747,300
Erosion rate (tons/acres)	2.9
Hayland and pasture (acres)	171,000
Erosion rate (tons/acres)	0.2
Idle cropland (acres)	213,700
Erosion rate (tons/acres)	0.4
Forest converted to cropland (acres)	95,900
Pasture converted to forest (acres)	74,300

Land Treatment, Critically Eroding Areas: Treatment of critically eroding areas is aimed at sediment reduction in streams, improving the appearance of the landscape and protecting the soil resource. In the environmental quality alternative, treatment will be planned beyond stabilization, to restoration to productive use.

Treatment of roadsides includes sloping banks, preparing seedbeds, fertilization, seeding and mulching. Gully treatment includes grade stabilization structures, debris basins, overfall pipes and seeding. Construction sites usually require debris basins, seeding and mulching. Galled areas in fields need smoothing, seedbed preparation and seeding. Old mines are treated by smoothing, seeding and construction of debris basins. Beach treatment is planned for individual sites and usually require structures as well as seeding.

Treatment of critically eroding areas makes a significant impact on the reduction of sediment delivered off-site.

Other Areas: At least 500 ponds will receive improvement management by weed control, sediment reduction, fertilization and restocking.

Urban areas, where erosion is a problem, will receive treatment and protection. Also, urban forestry practices will be utilized to reduce noise and air pollution.

Structural

Channel Work: Channels for flood control and drainage include 530 miles of outlet channels and 100 miles of outlet channels for built-up areas. Channels included in the environmental quality alternative are those that would have the least adverse environmental impact. Environmental considerations included high value wetlands, natural vegetation, archeological sites, hardwood timber sites and wildlife areas.

Water Supply and Distribution Systems: Plans for development of water supply and distribution systems in the environmental quality alternative are the same as in the national economic development alternative. Small communities will develop supplies from ground water, while the larger cities will expand their use of surface water sources. Twenty-nine (29) communities will either install new distribution systems or will expand their old systems. Costs of the planned measures are expected to equal $45,750,000.

Recreation Development: Recreation plans are the same as the national economic development alternative. Sixteen public areas are included at a cost of $40,371,000 that will result in 2,172,000 visitor days annually. In addition, the environmental quality plan includes multiple use of forest resources for recreation.

Wastewater Treatment: Thirty-seven (37) communities plan to install wastewater treatment systems and 14 communities plan to expand their systems to reduce point sources of water pollution. The costs of installing and improving these systems are estimated to be $60 million. (See Figure 7-6 and Table 7-8.)

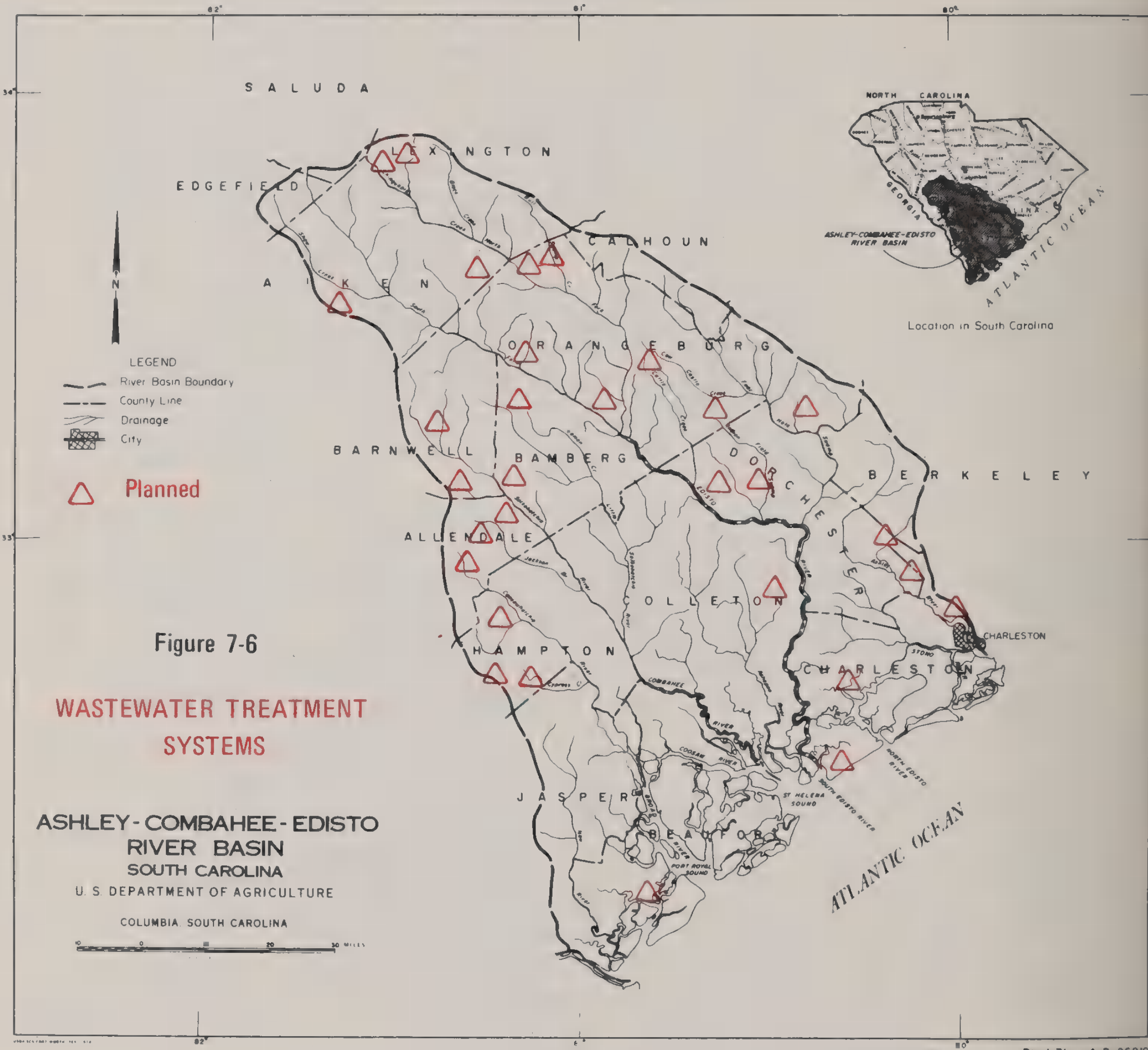

Figure 7-6

WASTEWATER TREATMENT SYSTEMS

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TABLE 7-8: WASTEWATER TREATMENT SYSTEMS
ENVIRONMENTAL QUALITY ALTERNATIVE

ACE BASIN

Region/County	Install System	Expand or Update System
REGION 5		
Aiken County	Monetta	Aiken
	Perry	
	Salley	
Allendale County	Sycamore	Allendale
	Ulmers	
Bamberg County	Ehrhardt	Bamberg
	Olar	Denmark
Barnwell County	Hilda	Barnwell
	Kline	Blackville
Orangeburg County	Bowman	Holly Hill
	Cope	North
	Cordova	Orangeburg
	Neeses & Livingston	
	Norway	
	Rowesville	
	Springfield	
	Woodford	
REGION 9		
Charleston County	Hollywood	North Charleston
Dorchester County	Harleyville	
	Reevesville	
	Ridgeville	
	St. George	
	Summerville Area	
REGION 10		
Beaufort County	Beaufort	
	Bluffton	
Colleton County	Cottageville	Walterboro
	Edisto Beach	
	Lodge	
	Ruffin	
	Smoaks	
	Williams	
Hampton County	Luray	Estill
	Scotia	
OTHERS		
Edgefield County	Johnson	
	Trenton	
Lexington County	Pelion	Batesburg
		Leesville

Non-point sources are more difficult to identify. The statewide studies under Section 208, Public Law 92-500 will identify non-point sources and outline plans for control. Plans for reducing non-point sources include conservation practices carried out by farmers and other land users. Plans for sediment reduction are closely associated with erosion control which is described under "Land Treatment". Other plans include improved use of agricultural chemicals to prevent off-site damage. Costs of non-point source treatment are included in other appropriate sections.

Comparison of Alternatives

The national economic development alternative emphasizes economic development of the basin. Greater amounts of income producing elements such as agricultural flood reduction and drainage and forestry improvement are included. The environmental quality alternative emphasizes such elements as water quality, wildlife, natural beauty and cultural values. Table 7-9 shows component needs, amounts planned in each alternative and remaining needs.

Display of Accounts

A display of accounts has been prepared to show alternative plan measures and effects. Cost estimates are based on costs of recently constructed projects and have 1975 as their base year. Costs are amortized over 50 years at an interest rate of 6-3/8 percent. Beneficial and adverse effects, when given a monetary value, are measured in average annual dollars. All nonagricultural effects are based on 1975 prices, while agricultural effects are based on current normalized prices.

TABLE 7-9: COMPARISON OF EFFECTIVENESS OF ALTERNATIVES TO MEET COMPONENT NEEDS

ACE BASIN

Component Needs		NED Alternative Amount Planned	NED Alternative Remaining Need	EQ Alternative Amount Planned	EQ Alternative Remaining Need
Erosion Damage Reduction and Increased Production Efficiency					
Cropland	753,600 acres	240,800 acres	494,800 acres	509,900 acres	243,700 acres
Pastureland	207,700 acres	140,000 acres	67,700 acres	130,000 acres	77,700 acres
Forest land	2,220,500 acres	560,000 acres	1,660,500 acres	350,000 acres	1,870,000 acres
Public Recreational Areas	16 sites	16 sites	0 sites	16 sites	0 sites
Critical Erosion Damage Reduction	7,452 acres	0 acres	7,452 acres	6,960 acres	492 acres
	8 beaches	0 beaches	8 beaches	8 beaches	0 beaches
Solid Waste Disposal	16 sites	0 sites	16 sites	16 sites	0 sites
Wastewater Treatment	51 systems	0 systems	51 systems	51 systems	0 systems
Improvement of Natural Beauty					
Wild and Scenic Rivers	226 miles	0 miles	226 miles	226 miles	0 miles
Forest Practices	70,000 acres	0 acres	70,000 acres	55,000 acres	15,000 acres
Floodwater Damage Reduction and Drainage					
Agricultural land	701,400 acres	440,000 acres	261,400 acres	133,000 acres	568,400 acres
Homes & Businesses	4,700 number	3,000 number	1,700 number	2,850 number	1,850 number
Improved Water Distribution	29 systems	29 systems	0 systems	29 systems	0 systems
Irrigation Water Storage	10,000 ac.ft.	10,000 ac.ft.	0 ac.ft.	10,000 ac.ft.	0 ac.ft.
Wildlife Habitat Improvement	300,000 acres	0 acres	300,000 acres	240,000 acres	60,000 acres
Fish Habitat Improvement	2,000 acres	0 acres	2,000 acres	2,000 acres	0 acres
Preservation of Habitat for Threatened and Endangered Species	10 sites	0 sites	10 sites	10 sites	0 sites
Protection of Wetlands	814,910 acres	0 acres	814,910 acres	814,910 acres	0 acres
Protection of Archeological and Historical	1,528 sites	0 sites	1,528 sites	1,528 sites	0 sites

NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of effects (Average Annual) 1/
Beneficial Effects	
Value to users of increased outputs of goods and services	
1. Agricultural flood prevention and drainage and improved production efficiency	$ 8,938,000
2. Nonagricultural flood prevention	482,000
3. Recreation	3,910,000
4. Water supply and distribution	3,636,000
5. Utilization of unemployed and underemployed labor resources	
a. project construction	634,000
b. OM&R costs	259,000
Total beneficial effects	$17,859,000

Components	Measures of effects (Average Annual) 2/
Adverse Effects	
Value of resources required for a plan	
1. Agricultural outlet channels and on-farm systems	
a. installation costs	$ 4,245,000
b. OM&R costs	982,000
2. Nonagricultural outlet channels	
a. installatior costs	189,000
b. OM&R costs	25,000
3. Flood proofing and relocation	75,000
4. Recreation development	
a. installation costs	2,696,000
b. OM&R costs	850,000
5. Water supply and distribution	
a. installation costs	3,056,000
b. OM&R costs	400,000
6. Project administation	818,000
Total adverse effects	$13,336,000
Net beneficial effects	$ 4,523,000

1/ Agricultural benefits, current normalized; all other, 1975.
2/ 1975 price base, costs amortized at 6 3/8 percent for 50 years.

NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Areas of Natural Beauty	1. Reforestation of 213,600 acres.
	2. Reduction of erosion on 171,400 acres of cropland as a result of land treatment which will result in a reduction of sediment delivery into lakes and streams.
	3. Create 500 lakes and ponds with 80 miles of shoreline.
	4. Installation of 1,840 miles of channel will change the natural vegetation along rights-of-way.
	5. Planting grass on 85,000 acres will reduce erosion.
	6. As a result of improved production efficiency, 769,600 acres of cropland will be required as compared to 784,700 acres under without plan conditions.
B. Quality considerations of water, land and air resources	1. Erosion control practices on 256,400 acres of eroding land will improve land and water quality.
	2. Timing of prescribed burning on 500,000 acres and forest fire prevention will reduce air pollution.
	3. Flood prevention measures will decrease land damage on 440,000 acres.
	4. Windbreaks, hedgerows, trees, grass and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.
	5. Creation of 500 lakes will inundate 750 acres of land.
C. Biological resources and selected ecosystems	1. Improved fish pond management on 850 ponds and construction and stocking of 600 ponds.
	2. Reduction of stream pollution to improve and protect fishery habitat.
	3. Field border plantings, hedgerow plantings, open-area plantings and cropland multiple use can benefit numerous wildlife species by providing food and cover and increasing edge habitat.
	4. Reforestation of 213,600 acres.
	5. Prescribed burning of 500,000 acres of forest land will increase deer browse and native quail foods.
	6. 1,840 miles of main outlet channels will have varying effects on fish and wildlife.
D. Irreversible or irretrievable commitments	1. Creation of 500 lakes inundates 750 acres of land.
	2. Channel work will result in clearing 7,280 acres of forest.

NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of effects State of South Carolina	Measures of effects Rest of Nation
Income:		
Beneficial Effects	(Average Annual) 1/	
A. Value of increased output of goods and services to users residing in the region		
1. Flood prevention and drainage	$ 9,420,000	-
2. Recreation	3,460,000	$ 450,000
3. Water supply and distribution	3,636,000	-
4. Utilization of unemployed and underemployed labor resources		
a. construction	625,000	-
b. OM&R	378,000	-
B. Value of output to users residing in the region from external economies		
Indirect activities associated with increased net returns from drainage and flood prevention	6,907,000	-
Total Beneficial Effects	$24,426,000	$ 450,000
Adverse Effects		
Value of resources contributed from within the region to achieve the output		
1. Main outlet channels and on-farm systems		
a. installation costs	$ 2,527,000	$ 1,907,000
b. OM&R costs	1,007,000	-
2. Flood proofing and relocation	75,000	-
3. Recreation development		
a. installation costs	1,589,000	1,107,000
b. OM&R costs	850,000	-
4. Water supply and distribution		
a. installation costs	3,056,000	-
b. OM&R costs	400,000	-
5. Project administration	211,000	607,000
Total Adverse Effects	$ 9,715,000	$ 3,621,000
Net Beneficial Effects	$14,711,000	$-3,171,000

Components	Measures of effects State of South Carolina	Measures of effects Rest of Nation
Employment:		
Beneficial Effects	(Average Annual) 1/	
Increase in the number and types of jobs		
1. Agricultural employment	527 permanent jobs in agricultural production	-
2. Employment in recreation	236 permanent jobs and 90 part-time jobs in recreational services	-
3. Employment for project construction	1,625 man-years of semi-skilled and unskilled employment for construction	-
4. Employment for project OM&R	334 permanent semi-skilled jobs for OM&R	-
Total Beneficial Effects	1,097 permanent jobs; 90 part-time jobs; 1,625 man-years of employment for construction	-
Adverse Effects	-	-
Total Adverse Effects	-	-
Net Beneficial Effects	1,097 permanent jobs; 90 part-time jobs; 1,625 man-years of employment for construction	-
Population Distribution:		
Beneficial Effects	Creates 1,097 permanent jobs, 90 part-time jobs and 1,625 man-years of employment for construction in an area that has experienced out-migration during the past two decades	-
Adverse Effects	-	-
Regional Economic Base and Stability:		
Beneficial Effects	Provides flood reduction and drainage for cropland and forest land for an area that is expected to remain in agriculture	-
Adverse Effects	-	-

1/ Agricultural benefits, current normalized; all other, 1975.

NATIONAL ECONOMIC DEVELOPMENT ALTERNATIVE

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Real Income Distribution	1. Creates 1,097 low to medium income permanent jobs, 90 part-time jobs and 1,625 man-years of employment for construction for area residents.
	2. Create regional benefits distribution of \$24,426,000 by income class as follows:

Income Class (\$)	% of Families in Income Class	% Benefits in Class
Less than \$3,000	18.4	20
\$3,000-10,000	49.7	50
More than \$10,000	31.9	30

3. Local costs to be borne by region total of \$9,690,000 with distribution by income class as follows:

Income Class (\$)	% of Families in Income Class	% Contributions in Class
Less than \$3,000	18.4	15
\$3,000-10,000	49.7	50
More than \$10,000	31.9	35

Components	Measures of effects
Beneficial and Adverse Effects	
B. Life, Health and Safety	1. Provide flood damage reduction to homeowners in 60 communities.
	2. Reduce insect breeding areas by removal of water in built-up areas.
C. Recreational Opportunities	Creates 2,672,000 recreational visitor-day activities.

ENVIRONMENTAL QUALITY ALTERNATIVE

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of effects (Average Annual) 1/
Beneficial Effects	
Value to users of increased outputs of goods and services	
1. Agricultural flood prevention and drainage and improved efficiency	$ 3,879,000
2. Nonagricultural flood prevention	402,000
3. Recreation	3,910,000
4. Water supply and distribution	3,636,000
5. Water quality improvement	5,307,000
6. Utilization of unemployed and underemployed labor	
a. construction	625,000
b. OM&R	378,000
Total Beneficial Effects	$18,137,000

Components	Measures of effects (Average Annual) 2/
Adverse Effects	
Value of resources required for a plan	
1. Agricultural outlet channels and on-farm systems	
a. installation costs	$ 1,543,000
b. OM&R costs	245,000
2. Nonagricultural outlet channels	
a. installation costs	131,000
b. OM&R costs	20,000
3. Flood proofing and relocation	104,000
4. Recreational development	
a. installation costs	2,696,000
b. OM&R costs	850,000
5. Water supply and distribution	
a. installation costs	3,056,000
b. OM&R costs	400,000
6. Wastewater Treatment	
a. installation costs	4,007,000
b. OM&R costs	1,000,000
7. Project administration	687,000
Total Adverse Effects	$14,739,000
Net Beneficial Effects	$ 3,398,000

1/ Agricultural benefits, current normalized; all other, 1975.
2/ 1975 price base, costs amortized at 6 3/8 percent interest for 50 years.

ENVIRONMENTAL QUALITY ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of effects: State of South Carolina	Measures of effects: Rest of Nation
Income:		
Beneficial Effects	(Average Annual) 1/	
A. Value of increased output of goods and services to users residing in the region		
1. Flood prevention and drainage and improved efficiency	$ 4,281,000	-
2. Recreation	3,460,000	$ 450,000
3. Water supply and distribution	3,636,000	-
4. Water quality improvement	5,307,000	-
5. Utilization of unemployed and underemployed labor resources		
a. construction	625,000	-
b. OM&R	378,000	-
B. Value of output to users residing in the region from external economies		
Indirect activities associated with increased returns from drainage and flood prevention	1,999,000	-
Total Beneficial Effects	$19,686,000	$ 450,000
Adverse Effects		
Value of resources contributed from within the region to achieve the output		
1. Main outlet channels and on-farm systems		
a. installation cost	$ 793,100	$ 881,000
b. OM&R cost	265,000	-
2. Flood proofing and relocation	104,000	-
3. Recreation development		
a. installation cost	1,589,000	1,107,000
b. OM&R cost	850,000	-
4. Water supply and distribution		
a. installation cost	3,056,000	-
b. OM&R cost	400,000	-
5. Wastewater treatment		
a. installation cost	4,007,000	-
b. OM&R cost	1,000,000	-
6. Project administration	168,000	519,000
Total Adverse Effects	$12,232,000	$ 2,507,000
Net Beneficial Effects	$ 7,454,000	$-2,057,000

Components	Measures of effects: State of South Carolina	Measures of effects: Rest of Nation
Employment:		
Beneficial Effects	(Average Annual) 1/	
Increase in the number and types of jobs		
1. Agricultural employment	238 permanent jobs in agricultural production	-
2. Employment in recreation service sector	236 permanent jobs and 90 part-time jobs in recreational services	-
3. Employment for project construction	2,530 man-years of employment for construction	-
4. Employment for project OM&R	292 permanent semi-skilled and unskilled jobs for OM&R	-
Total Beneficial Effects	766 permanent jobs, 90 part-time jobs and 2,530 man-years of employment for construction	-
Adverse Effects	-	-
Total Adverse Effects	-	-
Net Beneficial Effects	766 permanent jobs, 90 part-time jobs and 2,530 man-years of employment for construction	-
Population Distribution:		
Beneficial Effects	Creates 766 permanent jobs, 90 part-time jobs, and 2,530 man-years of employment for construction in an area that has experienced out-migration during the past two decades	-
Adverse Effects	-	-
Regional Economic Base and Stability:		
Beneficial Effects	Provides flood reduction and drainage to an area that is expected to remain in agriculture	-
Adverse Effects	-	-

1/ Agricultural benefits, current normalized; all other, 1975.

ENVIRONMENTAL QUALITY ALTERNATIVE

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Areas of natural beauty	1. Preservation of 226 miles of wild and scenic rivers.
	2. Improved selection and management of 16 solid waste disposal sites.
	3. Maintenance of maximum forest cover on 50,000 acres by limiting harvest to standard rotation.
	4. Modification of tree harvests will protect 20,000 acres of visual corridors and buffer strips.
	5. Reduction of erosion on 502,000 acres as a result of land treatment will reduce sediment delivery into lakes and streams.
	6. Create 850 acres of lakes and ponds with 80 miles of shoreline.
	7. Installation of 760 miles of channels will change the natural vegetation along rights-of-way.
	8. Critical area treatment on 6,960 acres will reduce scars and sediment resulting from critical erosion.
	9. Land treatment on 25 miles of beaches will prevent the loss of this scenic resource.
B. Quality considerations of air, land and water resources	1. Erosion control practices on 450,000 acres of eroding land will improve land and water quality.
	2. Flood prevention measures will decrease land damage on 133,000 acres.
	3. Installing or upgrading 51 sewage treatment plants will decrease the discharge of raw or partially treated sewage into the basin's watercourses.
	4. Buffer strips of forest cover left along streams will be visually appealing and decrease chances of stream ecosystem degradation.
	5. Inclusion of 226 miles of natural free-flowing rivers in the basin in the state's Wild and Scenic Rivers System will insure the maintenance of water quality of these rivers and protect adjacent lands (uplands and wetlands).
	6. Windbreaks, hedgerows, tree planting, grass planting and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.
	7. Technical assistance to loggers and timber buyers for better utilization of harvested timber and woods waste.
	8. Drainage of agricultural and forest lands may increase the possibility of sediment.
	9. Proper location and construction of 16 solid waste disposal sites will help maintain land and water quality.
	10. Creation of 600 ponds will inundate 850 acres of land.
	11. Improved agricultural efficiency will reduce the amount of land required for crops by 37,400 acres.
C. Biological resources and selected ecosystems	1. Improved fish pond management on 850 acres of ponds and construction and stocking of 600 ponds.
	2. Reduction of stream pollution to improve and protect fishery habitat.
	3. Protection of 814,910 acres of wetland wildlife habitat through drainage restrictions, land use regulations, land purchase and management and long-term agreements.
	4. Protection of estuaries and their associated marsh ecosystems.
	5. Field border plantings, hedgerow plantings, open area plantings and cropland multiple use can benefit numerous wildlife species by providing food and cover and increasing edge habitat.
	6. Maintaining hardwood stands to provide mast will increase habitat variability.
	7. Protection of 10 sites which are uniquely suited habitat for threatened and endangered species in the area.
	8. Conversion of 95,900 acres of forest land to crops will have disruptive effects on area wildlife.
	9. 760 miles of main channels, when installed, will have varying effects on fish and wildlife.
D. Archeological and historical	Protection of 1,528 archeological and historical sites.
E. Irreversible or irretrievable commitments	Creation of 600 ponds will inundate 850 acres. Construction of main channels will result in clearing 2,540 acres of forest.

ENVIRONMENTAL QUALITY ALTERNATIVE

SOCIAL WELL-BEING ACCOUNT

Components

Beneficial and Adverse Effects

A. Real Income Distribution

Measures of effects

1. Creates 766 low to medium income jobs, 90 part-time jobs and 2,530 man-years of employment for area residents.

2. Create regional benefits distribution of $18,686,000 by income class as follows:

Income Class ($)	% of Families in Income Class	% Benefits in Class
Less than $3,000	18.4	20
$3,000 - 10,000	49.7	50
More than $10,000	31.9	30

3. Local costs to be borne by region total of $12,232,000 with distribution by income class as follows:

Income Class ($)	% of Families in Income Class	% Contributions in Class
Less than $3,000	18.4	15
$3,000 - 10,000	49.7	50
More than $10,000	31.9	35

Components

Beneficial and Adverse Effects

B. Life, Health and Safety

Measures of effects

1. Provides flood damage reduction to homeowners in 39 communities.

2. Reduces insect breeding areas by removal of water in built-up areas.

Components

C. Recreational Opportunities

Measures of effects

Creates 2,672 visitor-days of recreational opportunities.

CHAPTER 8 - PREFERRED PLAN

The early action preferred plan combines the most desirable aspects of the national economic development alternative and the environmental quality alternative. The preferred plan is based on the desires of the public to increase economic development while protecting the environment. Public involvement was solicited from a wide range of interests through personal contacts, public meetings, and a personal preference questionnaire.

The preferred plan includes nonstructural and structural measures. Table 8-1 is a summary of the preferred plan. A basic assumption is that the measures installed will be of a quality to endure over an extended period. Effects of the plan are displayed in four accounts and sites of the planned measures are displayed on the Water and Land Resources Map in the back cover of this document.

Nonstructural

Nonstructural measures in the preferred plan include elements that will meet needs without major construction. Along with land use regulations, flood hazard analyses, and flood insurance, nonstructural measures in the preferred plan include flood proofing and relocation for flood damage reduction. These practices will be applied where practical and where high costs of flood protection are involved.

In the preferred plan, emphasis is placed on protection of wildlife habitat. Landowners will be encouraged to include wildlife as one of the important alternatives for land use in their conservation plans. Practices such as modified tree harvest, preservation of hedgerows, field border plantings and others will be included.

When planning land use and development, wetland preservation will be a major consideration. As soon as practical, all high value wetlands will be identified and their locations reported to those responsible for development.

More emphasis will be placed on the protection of estuaries from pollution and encroachment by development. The Coastal Zone Management Plan will set standards for protection of the estuaries.

For waterfowl habitat, one of the most important measures is the maintenance of the old rice fields along the coast. Dikes and water control devices must be operated and maintained for water level control. Seasonal seeding of these areas is also important.

The preferred plan includes the preservation of at least 10 of the sites selected as most valuable habitat for threatened and endangered species. These will be identified in the study by the South Carolina Wildlife and Marine Resources Department and The Citadel.

TABLE 8-1: PREFERRED PLAN FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	Preferred Plan Amount	Preferred Plan Cost ($)
Erosion Damage Reduction and Improved Production Efficiency						
Cropland	Ac.	753,600				
			A. Terraces & waterways	Ac.	16,000	640,000
			B. Waterways & contour farming	Ac.	62,000	775,000
			C. Minimum tillage	Ac.	115,000	1,725,000
			D. Grass based rotations	Ac.	4,000	120,000
			E. Wind erosion control	Ac.	10,000	300,000
			Irrigation	Ac.	10,000	100,000
			Shift from forest to crops	Ac.	40,900	3,067,000
Pastureland	Ac.	207,700				
			Pasture & hayland planting	Ac.	80,000	3,200,000
			Improved management	Ac.	160,000	1,600,000
			Ponds	No.	200	800,000
Forest land	Ac.	2,220,500				
			Reforestation	Ac.	110,000	3,025,000
			Timber stand improvement	Ac.	200,000	7,000,000
			Improved utilization & marketing	Cu.Ft.	102,000,000	5,140,000
			Prescribed burning	Ac.	500,000	1,250,000
			Mortality reduction	Cu.Ft.	1,800,000	90,000
			Fertilization	Ac.	300,000	18,600,000
			Improved logging roads and skid trails	Mi.	75	10,000

TABLE 8-1: PREFERRED PLAN FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	Preferred Plan Amount	Preferred Plan Cost ($)
Floodwater Damage Reduction and Drainage on Agricultural and Forest Land	Ac.	701,400				
			Major outlet channels	Mi.	1,120	18,174,000
			On-farm systems:			
			cropland	Ac.	184,100	21,356,000
			pastureland	Ac.	17,500	1,348,000
			forest land	Ac.	155,000	8,825,000
			other land	Ac.	17,000	1,650,000
Nonagricultural Floodwater Damage Reduction						
Communities	No.	78				
Homes & businesses	No.	4,700				
			Flood proofing or relocating homes and businesses	No.	450	1,407,000
			Outlet channels	Mi.	112	2,188,000
Improved Water Supply and Distribution System						
Water supply	MGD	15.3				
Complete distribution systems	No.	9				
Expanded distribution systems	No.	20				
			Wells	MGD	15.3	
			Install system	No.	29	45,750,000
Irrigation	Ac.Ft.	10,000				
			Ponds	Ac.Ft.	10,000	1,660,000

TABLE 8-1: PREFERRED PLAN FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	Preferred Plan Amount	Preferred Plan Cost ($)
Increased Public Recreation Areas	No.	16				
			Public areas	No.	16	48,639,000
			Forest multiple use (for recreation)	Ac.	3,000	21,000
Critical Erosion Damage Reduction						
Road areas	Ac.	1,200	Treatment of road areas	Ac.	1,000	190,000
Gullies	Ac.	100	Treatment of gullied areas	Ac.	100	80,000
Construction sites	Ac.	3,000	Treatment of construction sites	Ac.	3,000	1,200,000
Galled areas	Ac.	620	Treatment of galled areas	Ac.	500	230,000
Old mines	Ac.	2,532	Treatment of old mines	Ac.	1,500	150,000
Beaches	No.	8	Treatment of beaches	No.	4	-
	Mi.	25		Mi.	12	240,000
Solid Waste Disposal Sites	No.	16				
			Site selection	No.	16	not evaluated
Wastewater Treatment Systems						
Complete systems	No.	14				
Expanded systems	No.	37				
			Install systems	No.	51	60,000,000
Improvement of Natural Beauty	Ac.	70,000				
			Wild and scenic rivers	Mi.	100	not evaluated
			Design harvest practices	Ac.	15,000	150,000
			Reduce wildfires	Ac.	17,600	688,000
			Maintain maximum forest cover	Ac.	50,000	50,000

TABLE 8-1: PREFERRED PLAN FOR MEETING 1990 NEEDS

ACE BASIN

Component Needs	Unit	Amount	Plan Elements	Unit	Preferred Plan Amount	Preferred Plan Cost ($)
Wildlife Area Improvement	Ac.	300,000				
			Field borders in cropland	Ac.	10,000	300,000
			Modified silvicultural practices	Ac.	30,000	300,000
			Maintain hardwood timber types	Ac.	200,000	600,000
Fish Habitat Improvement	Ac.	2,000				
			Pond construction	No.	100	450,000
			Fish pond improvement	Ac.	2,000	40,000
Preservation of Habitat for Threatened and Endangered Species (Sites)	No.	10				
			Site identification & selection	No.	10	not evaluated
Protection of Wetlands	Ac.	814,910				
			Wetlands	Ac.	814,910	not evaluated
Protection of Archeological and Historical Sites	No.	1,528				
			Site protection	No.	1,528	not evaluated

The state's Wild and Scenic River Program is one of the important legislative authorities that could be used to preserve some of the streams in their natural state. During the early action period, this program could result in the protection of 100 miles of streams.

Land Treatment, Cropland: An accelerated land treatment program is planned in the basin to meet sediment reduction, land resource protection, scenic beauty, wildlife habitat improvement, fish habitat improvement and production efficiency needs. As agricultural production requirements are met, the greater demands placed on the land and water resources will increase erosion and other problems, if resources are not properly treated and managed.

The preferred plan assumes a land treatment program that will improve the efficiency of agricultural production while reducing soil erosion and improving the long term productivity of the land resource base. In these aspects, the preferred plan combines desirable characteristics of both the national economic development and environmental quality alternatives. A summary of the land treatment programs assumed with this alternative is shown in Table 8-2. Expected agricultural production under these conditions is presented in Table 8-3, with an associated land use summary in Table 8-4. This plan shows an expected efficiency gain in agricultural production of $3,144,000 over the without plan conditions presented in Chapter 5. A reduction in soil erosion of approximately 410,000 tons each year would also result from implementation of the preferred plan.

Planting crops by the no-till method helps reduce soil erosion.

TABLE 8-2: TREATMENT OF CROP AND PASTURE LAND
PREFERRED PLAN

ACE BASIN

Region/Treatment	Amount ---(Acres)---
REGION 5	
Flood Damage Reduction and Drainage	50,900
Erosion Control and Sediment Reduction	194,000
REGION 9	
Flood Damage Reduction and Drainage	50,700
Erosion Control and Sediment Reduction	29,000
REGION 10	
Flood Damage Reduction and Drainage	100,000
Erosion Control and Sediment Reduction	54,000
TOTAL	
Flood Damage Reduction and Drainage	201,600
Erosion Control and Sediment Reduction	277,000

TABLE 8-3: CROPS, TOTAL PRODUCTION, ACREAGE AND YIELDS PER ACRE
PREFERRED PLAN

ACE BASIN

Commodity	Production	Acreage	Average Yield/Acre
Cotton	8,340,000 lbs.	16,300	511.7 lbs.
Corn	10,740,000 bu.	151,200	71.0 bu.
Wheat	753,000 bu.	17,900	42.0 bu.
Oats	691,000 bu.	12,800	54.0 bu.
Barley	770,000 bu.	13,600	56.6 bu.
Roughage	358,000 tons	162,700	2.2 tons
Sorghum	12,000 bu.	300	40.0 bu.
Soybeans	14,088,000 bu.	471,200	29.9 bu.
Tobacco	1,740,000 lbs.	700	2,485.7 lbs.
Peanuts	14,000,000 lbs.	5,200	2,692.3 lbs.
Peaches	362,000 bu.	2,100	172.5 bu.
Tomatoes	31,000 tons	5,600	5.6 tons
Crop Failure		30,400	
Minor Crops		41,900	
Total		931,900	

TABLE 8-4: LAND USE AND EROSION RATES
PREFERRED PLAN

ACE BASIN

Land Use and Erosion Rates	Amount
Planted cropland (acres)	769,200
Erosion rate (tons/acres)	6.2
Hayland and pasture (acres)	162,700
Erosion rate (tons/acres)	0.2
Idle cropland (acres)	188,100
Erosion rate (tons/acres)	0.4
Forest converted to cropland (acres)	40,900
Pasture converted to forest (acres)	53,900

Erosive soils that are to remain in crops will be treated by a system of practices designed to meet individual soil problems. Flatter slopes will be drained and protected from flooding to increase their productive capacity and to remove the pressure from some of the steeper, more erosive areas so that they may be removed from crop production and planted to grass or trees. The systems as defined in Chapter 7 under the "National Economic Development Alternative" are used in the preferred plan. About 369,000 acres will be treated for erosion control, 10,000 acres for irrigation and 157,800 acres will be treated by tile drains and open ditches.

Land Treatment, Grassland: Grassland treatment is aimed at more efficient production of forage as well as erosion control. During conservation planning, the selection of fields for forage production, as well as management practices, is important.

Land Treatment, Forest Land: The preferred plan includes forest resource development programs designed to meet demands for all uses until 1990. Beyond that period, neither the preferred plan nor the other alternatives can meet the total demand for wood fiber production. It is essential, however, that all technological methods be employed to reduce the deficit projected for 2020.

Restricting reforestation to the more productive sites of non-stocked or poorly stocked commercial forest land reduces tree planting requirements to 443,100 acres. By 1990, 150,000 acres will be reforested at a cost of 4.1 million dollars.

About 65 million cubic feet of salvable wood now standing as rough and rotten trees will be retrieved through improved methods. Cost of harvesting will be five cents per cubic foot, or $3,250,000.

By 1990, 135,000 acres will be treated through timber stand improvement, increasing annual growth by 1/4 cord per acre per year.

Intensive management to reduce timber losses from fire, disease, insects and weather will increase basin timber production by 3.7 million cubic feet annually. Management practices include forest fire prevention, prescribed burning, insect and disease prevention and control, and salvage of damaged timber.

Removal of excess surface water from 200,000 acres of forest land will increase annual wood fiber production by 3.7 million cubic feet at a cost of $9.85 per acre for an entire rotation.

Fertilizer will be applied on 450,000 acres by 1990. Costs will be $60 per acre using a fertilizer application rate of 1,000 pounds per acre, including labor.

Reforestation of 50,000 acres of idle land will add 4.69 million board feet to growing stock inventory.

The plan includes 8,000 acres of visual corridors along roads and water routes that will cost $8,000.

Reduction of wildfires will help preserve the visual quality of the forest landscape. Wildfires can be reduced by 17,600 acres at a cost of $688,000. This will bring uncontrolled fires to 5,300 acres annually, the allowable burn established by the South Carolina State Commission of Forestry.

Logging operations will be inspected to identify erosion hazards created in building and using logging roads and skid trails, and a set of recommendations prepared for the logging operator or

landowner.

Prescribed burning carried out every four years in this pine forest removes unwanted brush and weeds and creates conditions favorable for growth of grasses and forbs needed by wildlife. Also, removal of rough and heavy brush is an aid in wildfire control.
(Photograph courtesy of South Carolina State Commission of Forestry)

Trails through forest land provide enjoyment for all ages.

Sites will be managed for multiple uses, including timber production, recreation and wildlife. Where hardwood stands are understocked, restocking should be attempted by using regeneration cuttings. A four year cycle of prescribed burning in pine stands is recommended for protection and development of wildlife habitat and for protection of timber stands from severe damage caused by wildfires. This will require prescribed burning of 250,000 acres annually at a cost of $2.50 per acre.

Habitat supporting threatened and endangered species of plants and animals will be protected and enhanced through appropriate silvicultural practices. Initial steps to protect these species consist of identifying and mapping habitat location. Within the ACE Basin, there are 170,000 acres of deep swamps and broad stream margins suitable for habitat. Additional steps include purchasing and/or leasing of habitat acreage and modifying timber harvesting practices within these areas.

Land Treatment, Critically Eroding Areas: Goals for critical area treatment include sediment reduction, protection of the soil resource base, improvement in natural beauty and wildlife area enhancement. Measures in the preferred plan go beyond retarding the growth of critical areas, but fall short of total restoration to full production. Gully treatment includes grade control structures, overfall pipes, sloping banks and establishing vegetation. Natural vegetation will be utilized as much as practical. Treatment of construction sites includes diversions, sediment basins and vegetation. Treatment of field galled areas includes site preparation and vegetation. Roadside treatment will include sloping banks and vegetation. Treatment of old mined areas includes site preparation, debris basins and vegetation.

Being prepared to irrigate high value crops is a form of insurance.

Land Treatment, Other Land Uses: Plantings for wildlife habitat improvement are included in cropland, forest land and critical area treatment plans. Development for wildlife food and cover will be considered in all conservation plans. At least 580 farm ponds, designed for multiple uses such as irrigation, livestock water, sediment storage, fish production and recreation are planned for the basin during the early action period.

Structural

Structural measures are planned to meet needs which nonstructural and land treatment measures cannot satisfy. Often structural, non-structural and land treatment measures are used in combination to solve a problem.

Channel Work: Channels included in the preferred plan are those most needed to solve agricultural and nonagricultural floodwater and drainage problems. Environmental quality factors such as wetland, forest cover, wildlife values, fishery values and archeological and historical values were considered in selecting channels to be included in the preferred plan. A total of 1,232 miles of main outlet channels are included in the preferred plan. These channels will cost about $20,362,000.

Water Supply and Distribution Systems: Water supplies for the smaller communities and rural areas will be developed from ground water, while the larger centers such as Charleston, Beaufort, Orangeburg and Aiken will expand their present surface water sources. No major reservoirs are planned. Both ground water and surface water supplies seem to be adequate through the early action time period.

Twenty-nine (29) small communities plan to either install new water distribution systems or expand their old systems. The cost of these 29 systems is estimated to be $45,750,000. Larger centers plan to expand their systems as populations increase.

Recreation Development: Plans for recreation development by the public sector include 16 public areas. These areas are estimated to cost $40,371,000 and will result in benefits of 2,117,200 visitor days of use each year.

People prefer water-based recreational areas.

Wastewater Treatment: Thirty-seven (37) communities plan to install wastewater treatment systems and 14 communities plan to expand their systems to reduce point sources of water pollution. The costs of installing and improving these systems are estimated to be $60 million.

Statewide studies under Section 208, Public Law 92-500, will identify non-point sources of pollution and present plans for reducing these sources. Plans for reducing non-point sources include conservation practices carried out by farmers and other land users. Plans for sediment reduction are closely associated with erosion control which is described under "Land Treatment, Cropland". Other plans include improved use of agricultural chemicals to prevent off-site damage. Costs of non-point source treatment are included in other appropriate sections.

Comparison of Alternatives and Preferred Plan

Table 8-5 shows a summary comparison of the national economic development alternative, the environmental quality alternative and the preferred plan. Both beneficial and adverse effects are shown by the four accounts. The national economic development alternative shows greater net monetary and employment effects. The environmental quality alternative places greater emphasis on water quality, natural beauty, fish and wildlife and cultural values. The preferred plan combines both economic and environmental elements of the alternatives.

TABLE 8-5: COMPARISON OF EFFECTIVENESS OF ALTERNATIVES AND PREFERRED PLAN TO MEET COMPONENT NEEDS

ACE BASIN

Component Needs		NED Alternative	EQ Alternative	Preferred Plan	
		Amount Planned	Amount Planned	Amount Planned	Remaining Need
Erosion Damage Reduction and Increased Production Efficiency					
Cropland	753,600 acres	240,800 acres	509,900 acres	257,900 acres	495,700 acres
Pastureland	207,700 acres	140,000 acres	130,000 acres	160,000 acres	47,700 acres
Forest land	2,220,500 acres	560,000 acres	350,000 acres	495,000 acres	1,725,500 acres
Public Recreational Areas	16 sites	16 sites	16 sites	16 sites	0 sites
Critical Erosion Damage Reduction	7,452 acres	0 acres	6,960 acres	6,100 acres	1,352 acres
	8 beaches	0 beaches	[illegible] beaches	4 beaches	4 beaches
Solid Waste Disposal	16 sites	0 sites	16 sites	16 sites	0 sites
Wastewater Treatment	51 systems	0 systems	51 systems	51 systems	0 systems
Improvement of Natural Beauty					
Wild and Scenic Rivers	226 miles	0 miles	226 miles	100 miles	126 miles
Forest Practices	70,000 acres	0 acres	55,000 acres	43,000 acres	27,000 acres
Floodwater Damage Reduction and Drainage					
Agricultural land	701,400 acres	440,000 acres	133,000 acres	373,600 acres	427,8[illegible] acres
Homes & Businesses	4,700 number	3,000 number	2,850 number	2,950 number	1,[illegible] number
Improved Water Distribution	29 systems	29 systems	29 systems	29 systems	0 systems
Irrigation Water Storage	10,000 ac.ft.	10,000 ac.ft.	10,000 ac.ft.	10,000 ac.ft.	0 ac.ft.
Wildlife Habitat Improvement	300,000 acres	[illegible] acres	240,000 acres	230,000 acres	70,000 acres
Fish Habitat Improvement	2,000 acres	0 acres	2,000 acres	2,00 acres	0 acres
Preservation of Habitat for Threatened and Endangered Species	10 sites	0 sites	10 sites	10 sites	0 sites
Protection of Wetlands	814,910 acres	0 acres	814,910 acres	814,910 acres	0 acres
Protection of Archeological and Historical	1,528 sites	0 sites	1,528 sites	1,528 sites	0 sites

Display of Accounts

A display of accounts has been prepared to show plan measures and effects. Cost estimates are based on costs of recently constructed projects, and have 1975 as their base year. Costs are amortized over 50 years at an interest rate of 6-3/8 percent. Beneficial and adverse effects, when given a monetary value, are measured in average annual dollars. Nonagricultural effects are based on 1975 prices, while agricultural effects are based on current normalized prices. Costs and benefits of on-farm drainage systems were evaluated. Other land treatment practices and environmental measures were not evaluated.

Comparison of Effects of Alternatives and Preferred Plan

The four account displays give beneficial and adverse effects of each of the alternatives. For a comparison of the effects, Table 8-6 is a summary of these effects taken from the displays listed under each alternative.

TABLE 8-6: SUMMARY OF EFFECTS OF ALTERNATIVES AND PREFERRED PLAN

ACE BASIN

Accounts	NED Alternative	EQ Alternative	Preferred Plan
National Economic Development Account			
Beneficial Effects	$17,859,000	$18,137,000	$21,954,000
Adverse Effects	$13,336,000	$14,739,000	$17,441,000
Net Beneficial Effects	$ 4,523,000	$ 3,398,000	$ 4,513,000
Environmental Quality Account			
Beneficial and Adverse Effects			
A. Reduce erosion & sediment	366,400 acres	508,960 acres	400,000 acres
B. Reduce flood damage & improve drainage	440,000 acres	133,000 acres	373,600 acres
C. Change vegetation along channel rights-of-way (mostly intermittent streams)	1,840 miles	760 miles	1,232 miles
D. Create lakes & ponds	500 number	600 number	600 number
E. Land inundated by lake & pond construction	750 acres	850 acres	850 acres
F. Land clearing for channels	7,280 acres	2,540 acres	5,100 acres
G. Prescribed burning	500,000 acres	0 acres	500,000 acres
H. Preserve wild & scenic rivers	0 miles	226 miles	100 miles
I. Solid waste disposal	0 sites	16 sites	16 sites
J. Reforestation	213,600 acres	73,300 acres	110,000 acres
K. Restricted harvesting of timber along visual corridors	0 acres	50,000 acres	50,000 acres
L. Reduced wildfires	0 acres	17,600 acres	17,600 acres
M. Beach erosion control	0 miles	25 miles	25 miles
N. Improve water quality by installing or improving sewage treatment plants	0 number	51 number	51 number
Regional Development Account			
Income			
Beneficial Effects	$24,876,000	$20,136,000	$27,755,000
Adverse Effects	$13,336,000	$14,739,000	$16,941,000
Net Beneficial Effects	$11,540,000	$ 5,397,000	$10,823,000
Employment			
Net Beneficial Effects	1,097 permanent jobs 90 part-time jobs 1,625 man-years for construction	766 permanent jobs 90 part-time jobs 2,530 man-years for construction	1,079 permanent jobs 90 part-time jobs 2,957 man-years for construction
Population Distribution	Reduce out-migration trend	Reduce out-migration trend	Reduce out-migration trend
Regional Economic Base & Stability	Provide flood reduction & drainage for an area expected to remain in agriculture	Provide flood reduction & drainage for an area expected to remain in agriculture	Provide flood reduction & drainage for an area expected to remain in agriculture
Social Well-Being Account			
Beneficial and Adverse Effects			
A. Real Income Distribution	Redistribute income to lower income groups	Redistribute income to lower income groups	Redistribute income to lower income groups
B. Life, Health & Safety	Provide flood damage reduction to homeowners Reduce insect breeding areas	Provide flood damage reduction to homeowners Reduce insect breeding areas	Provide flood damage reduction to homeowners Reduce insect breeding areas
C. Recreational opportunities	Provide 2,672,000 visitor-days	Provide 2,672,000 visitor-days	Provide 2,672,000 visitor-days

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of effects (Average Annual) 1/
Beneficial Effects	
Value to users of increased outputs of goods and services	
1. Agricultural flood prevention and drainage and improved production efficiency	$ 7,843,000
2. Nonagricultural flood prevention	459,000
3. Recreation	3,910,000
4. Water supply and distribution	3,636,000
5. Water quality improvement	5,307,000
6. Utilization of unemployed and underemployed labor resources	
a. construction	596,000
b. OM&R	203,000
Total Beneficial Effects	$21,954,000

Components	Measures of effects (Average Annual) 2/
Adverse Effects	
Value of resources required for a plan	
1. Agricultural outlet channels and on-farm systems	
a. installation systems	$ 3,430,000
b. OM&R costs	771,000
2. Nonagricultural outlet channels	
a. installation costs	146,000
b. OM&R costs	24,000
3. Flood proofing and relocation	94,000
4. Recreational development	
a. installation costs	2,696,000
b. OM&R costs	850,000
5. Water supply and distribution	
a. installation costs	3,056,000
b. OM&R costs	400,000
6. Wastewater treatment	
a. installation costs	4,007,000
b. OM&R costs	1,000,000
7. Project administration	967,000
Total Adverse Effects	$17,441,000
Net Beneficial Effects	$ 4,513,000

1/ Agricultural benefits, current normalized prices; all other, 1975 prices.
2/ Price base - 1975, costs amortized at 6 3/8 percent interest for 50 years.

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Areas of natural beauty	1. Preservation of 100 miles of wild and scenic rivers.
	2. Improved selection and management of 16 waste disposal sites.
	3. Maintenance of maximum forest cover on 50,000 acres by limiting harvest to standard rotation.
	4. Reforestation of 110,000 acres.
	5. Restriction of tree harvests to protect 50,000 acres of visual corridors and buffer strips.
	6. Reduce erosion on 400,000 acres as a result of land treatment.
	7. Reduce sediment delivery into lakes and streams.
	8. Create 850 acres of lakes and ponds with 80 miles of shoreline.
	9. Installation of 1,232 miles of main outlet channels will change the natural vegetation along rights-of-way.
B. Quality considerations of air, land and water resources	1. Erosion control practices on 400,000 acres of eroding land will improve land and water quality.
	2. Timing of prescribed burning and forest fire prevention will reduce air pollution.
	3. Flood prevention measures will decrease land damage [redacted] 373,600 acres.
	4. Upgrading of 51 sewage treatment plants will decrease the discharge of raw or partially treated sewage into the basin's watercourses.
	5. Buffer strips of forest cover left along streams will decrease chances of stream ecosystem degradation.
	6. Creation of 600 lakes will inundate 850 acres of land.
	7. Reduce land required to produce crops by 15,500 acres.
	8. Inclusion of 100 miles of natural free-flowing rivers in the basin in the state's Wild and Scenic Rivers System will insure the maintenance of water quality of these rivers and protect adjacent lands (uplands and wetlands).
	9. Windbreaks, hedgerows and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.
	10. Assistance to loggers and timber buyers will result in better utilization of harvested timber and woods waste.
	11. Channel construction can degrade water quality especially during construction.
	12. Beach erosion control can reduce losses of this resource.
C. Biological resources and selected ecosystems	1. Improved fish pond management on 850 ponds and construction and stocking of 600 ponds.
	2. Reduction of stream pollution will improve and protect fishery habitat.
	3. Protection of 814,910 acres of wetland wildlife habitat through drainage restrictions, land use regulations, land purchase and management and long-term agreements.
	4. Enactment of a State Coastal Zone Management Plan will insure protection of estuaries and their associated marsh ecosystems.
	5. Field border plantings, hedgerow plantings, channel rights-of-way plantings and cropland multiple use will benefit numerous wildlife species by providing food and cover and increase edge habitat.
	6. Reforestation of 110,000 acres of forest land can increase wildlife habitat for certain species.
	7. Prescribed burning of 500,000 acres of forest land will increase deer browse and native quail foods.
	8. Maintaining hardwood stands to provide mast will increase habitat variability.
D. Archeological and historical	No archeological or historical sites have been identified in the areas where work is planned. More detailed studies and plans for preservation will be made before construction is started.
E. Irreversible or irretrievable commitments	1. Creation of 600 lakes will inundate 850 acres of land.
	2. Channel work will result in clearing 5,100 acres of woods that will be replanted to grass.

PREFERRED PLAN

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of effects	
Income:	State of South Carolina	Rest of Nation
Beneficial Effects	(Average Annual) 1/	
A. Value of increased output of goods and services to users residing in the region		
1. flood prevention and drainage and improved production efficiency	$ 8,302,000	-
2. recreation	3,460,000	$ 450,000
3. water supply and distribution	3,636,000	
4. water quality improvement	5,307,000	-
5. utilization of unemployed and underemployed labor resources		
a. construction	596,000	-
b. OM&R	203,000	-
B. Value of output to users residing in the region from external economies		
indirect activities associated with flood prevention and drainage	5,801,000	-
Total Beneficial Effects	$27,305,000	$ 450,000
Adverse Effects		
Value of resources contributed from within the region to achieve the output		
1. main outlet channels and on-farm systems		
a. installation costs	$ 1,299,000	$ 2,277,000
b. OM&R costs	495,000	-
2. flood proofing and relocation	94,000	-
3. recreation development		
a. installation costs	1,589,000	1,107,000
b. OM&R costs	850,000	-
4. water supply and distribution		
a. installation costs	3,056,000	-
b. OM&R costs	400,000	-
5. wastewater treatment		
a. installation costs	4,007,000	-
b. OM&R costs	1,000,000	-
6. project administration	191,000	576,000
Total Adverse Effects	$12,981,000	$ 3,960,000
Net Beneficial Effects	$14,324,000	$-3,501,000

Components	Measures of effects	
Employment:	State of South Carolina	Rest of Nation
Beneficial Effects	(Average Annual) 1/	
Increase in the number and types of jobs		
1. agricultural employment	472 permanent jobs	-
2. employment in recreation service sector	236 permanent jobs and 90 part-time jobs	-
3. employment for project construction	2,957 man-years of employment	-
4. employment for project OM&R	371 permanent jobs	-
Total Beneficial Effects	1,079 permanent jobs, 90 part-time jobs and 2,957 man-years of employment for construction	-
Adverse Effects	-	-
Total Adverse Effects	-	-
Net Beneficial Effects	1,079 permanent jobs, 90 part-time jobs, and 2,957 man-years of employment for construction	-
Population Distribution:		
Beneficial Effects	Creates 1,079 permanent jobs, 90 part-time jobs and 2,957 man-years of employment for construction in an area that has experienced out-migration during the past two decades	-
Adverse Effects	-	-
Regional Economic Base and Stability:		
Beneficial Effects	Provides flood protection and drainage to an area that is expected to remain in agriculture	-
Adverse Effects	-	-

1/ Agricultural benefits, current normalized; all other, 1975.

PREFERRED PLAN

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Real Income Distribution	1. Creates 1,079 permanent jobs, 90 part-time jobs, and 2,957 man-years of employment for construction in the low to medium income groups for area residents.
	2. Create regional benefits distribution of $27,305,000 by income class as follows:

Income Class ($)	% of Families in Income Class	% Benefits in Class
Less than $3,000	18.4	20
$3,000 - 10,000	49.7	50
More than $10,000	31.9	30

3. Local costs to be borne by region total of $12,981,000 with distribution by income class as follows:

Income Class ($)	% of Families in Income Class	% Contri-butions in Class
Less than $3,000	18.4	15
$3,000 - 10,000	49.7	50
More than $10,000	31.9	35

Components	Measures of effects
Beneficial and Adverse Effects	
B. Life, Health and Safety	1. Provides flood damage reduction to residents in 54 rural communities.
	2. Reduces insect breeding areas by removal of water in built-up areas.
C. Recreational Opportunities	Provides 2,672 visitor-days of recreational opportunities.

CHAPTER 9 - OPPORTUNITIES FOR USDA PROGRAMS IN THE PREFERRED PLAN

This chapter describes the measures of the preferred plan which can be accomplished under USDA programs. All USDA programs depend on the interest, leadership and financial ability of local people. Before any of the measures can be implemented, detailed plans with appropriate environmental assessments or environmental impact statements must be made. Table 9-1 presents a summary of USDA opportunities in the preferred plan. The map in the back cover shows the general location of measures in the preferred plan.

Public Law 566

Public Law 566, the Small Watershed Act, could be utilized to install a portion of the measures in the preferred plan. The major use of this authority would be in flood control and drainage. Since most of the flooding problem areas are flat, where floodwater retarding structures are not feasible, channels are the major structural measures that would be installed. Before any work is carried out, watershed conservation districts must be organized and adequate financial arrangements must be made. A total of 13 watershed areas, involving 17 communities, have been identified as having potential for PL-566 implementation. Table 9-2 shows the watershed identification, the problem area, amount of channel work proposed and the number of acres that could benefit from the proposed work. Table 9-3 shows costs of channel work in the same projects. Table 9-4 shows a comparison of annual costs and benefits. Table 9-5 shows a possible cost-share distribution between federal funds and other funds.

Additional areas may receive assistance from USDA in flood hazard analysis that can help communities prevent future increases in flood damages by warning citizens of flood prone areas.

Public Law 46

Under Public Law 46, the Soil Conservation Service assists individuals and groups in the planning and application of conservation practices generally through soil and water conservation districts. The Resource Conservation and Development (RC&D) Program is also a part of Public Law 46.

Conservation Districts' Programs: Accelerated technical assistance in land use planning and treatment as well as application of conservation practices are the basic elements of the conservation

TABLE 9-1: USDA OPPORTUNITIES IN THE PREFERRED PLAN

ACE BASIN

USDA Program	Plan Elements	USDA Program Opportunities	USDA Program Cost 1/
PL-46 - Conservation Districts' Programs	Land treatment for erosion control, improved production efficiency, drainage and wildlife area improvement	Technical assistance for conservation planning and application of practices	2,646,000
Resource Conservation and Development (RC&D)	Critical area treatment	Technical assistance for planning, design and installation	20,000
		Cost sharing assistance for installation	800,000
	Channel work	Technical assistance for planning, design and installation	100,000
		Cost sharing for construction	8,424,000
	Recreation development	Technical assistance for planning, design and installation	40,000
		Cost sharing for engineering, land rights and construction	2,915,000
PL-566	Channel work	In 13 watershed projects, assistance for planning, design and installation	100,000
		Cost sharing for construction	4,849,000
Cooperative Forest Management	Forest land treatment	Technical assistance	2,634,000
General Forestry Assistance	Forest land treatment	Technical assistance	3,344,000
Cooperative Forest Fire Control	Forest land treatment	Technical assistance, manpower and equipment	190,000
Forest Insect and Disease Management	Mortality reduction	Technical assistance	25,000
Forestry Incentives Program	Reforestation and timber stand improvement	Cost sharing and technical assistance	3,775,000
Community Development Loan Programs (FmHA)	Water distribution systems	Loans for engineering and construction	(45,750,000)
	Wastewater treatment	Loans for engineering and construction	(60,000,000)
	Channel work	Loans to organizations for local share of construction	(2,615,000)
	Land treatment	Loans for installation of practices to individual landowners	(6,000,000)
	Recreational development	Loans to organizations for construction	(2,000,000)
Agricultural Conservation Program (ACP)	Land treatment	Financial assistance for cost-sharing with individual farmers and groups of farmers for installation of practices on cropland, pastureland, forest land and for recreation and wildlife	14,700,000

1/ 1975 price base.

TABLE 9-2: PL-566 WATERSHED PROJECTS

ACE BASIN

	Watershed Identification	County(ies)	Size (Acres)	Problem Area (Acres)	Proposed Channels (Miles)	Area Benefited by Proposed Channel (Acres)
1	Flee Bite Creek	Calhoun & Orangeburg	25,680	6,270	16	3,530
2	Good Bys Creek	Calhoun & Orangeburg	84,500	18,270	55	10,730
3	Upper Cow Castle & Patrick Branch	Orangeburg	48,290	18,110	54	10,360
4	Polk Swamp	Dorchester & Orangeburg	34,920	9,750	27	5,910
5	Indian Field Community	Dorchester & Orangeburg	70,350	24,980	81	14,990
6	Duncan Chapel	Dorchester & Orangeburg	42,380	7,240	81	3,910
7	Providence Swamp	Orangeburg	22,380	12,120	36	7,030
8	Target Swamp	Orangeburg	11,420	3,760	10	2,150
9	East Cottageville	Colleton	59,820	9,700	25	5,330
10	Ehrhardt	Bamberg	121,830	45,400	70	20,150
11	Ruffin-Smoaks-Williams	Bamberg & Colleton	54,360	9,000	32	5,410
12	Sheldon	Beaufort & Hampton	83,790	10,500	14	6,200
13	North Hilton Head	Beaufort	24,080	4,200	5	3,110
	TOTAL		683,800	179,300	442	98,810

TABLE 9-3: PL-566 WATERSHED PROJECTS
INSTALLATION COST

ACE BASIN

	Watershed Identification	Cost Item (1975 Dollars) Construction	Engineering	Land Rights	Administration	Total
1	Flee Bite Creek	237,000	12,000	39,000	13,000	301,000
2	Good Bys Creek	684,000	36,000	141,000	40,000	901,000
3	Upper Cow Castle & Patrick Branch	665,000	35,000	150,000	37,000	887,000
4	Polk Swamp	352,000	20,000	74,000	22,000	468,000
5	Indian Field Community	998,000	51,000	210,000	56,000	1,315,000
6	Duncan Chapel	257,000	17,000	49,000	18,000	341,000
7	Providence Swamp	456,000	23,000	90,000	24,000	593,000
8	Target Swamp	143,000	8,000	29,000	9,000	189,000
9	East Cottageville	342,000	18,000	70,000	16,000	446,000
10	Ehrhardt	855,000	44,000	171,000	47,000	1,117,000
11	Ruffin-Smoaks-Williams	418,000	22,000	85,000	22,000	547,000
12	Sheldon	209,000	11,000	41,000	10,000	271,000
13	North Hilton Head	67,000	4,000	12,000	4,000	88,000
	TOTAL	5,683,000	301,000	1,162,000	318,000	7,464,000

TABLE 9-4: PL-566 WATERSHED PROJECTS
COMPARISON OF ANNUAL COSTS AND BENEFITS

ACE BASIN

Watershed Identification	Annual Benefits: Flood Damage Reduction	Annual Benefits: Drainage	Annual Benefits: Total	Annual Costs: Installation	Annual Costs: Operation, Maintenance & Replacement	Annual Costs: Total
	(Dollars) 1/					
1 Flee Bite Creek	23,700	17,900	41,600	20,100	3,800	23,900
2 Good Bys Creek	66,300	55,000	121,300	60,200	10,400	70.600
3 Upper Cow Castle & Patrick Branch	66,900	55,600	122,500	59,200	10,000	69,200
4 Polk Swamp	39,300	28,900	68,200	31,300	5.300	36,600
5 Indian Field Community	105,900	73,600	179,500	87,800	15,400	103,200
6 Duncan Chapel	27.100	20,900	48,000	22,800	4,200	27,000
7 Providence Swamp	45,700	37,400	83,100	39.600	6,800	46,400
8 Target Swamp	22.800	18,200	41,000	12,600	1,900	14,500
9 East Cottageville	51,400	40,400	91,800	29,800	5,100	34,900
10 Ehrhardt	83.000	67,300	150,300	74,600	12,900	87.500
11 Ruffin-Smoaks-Williams	44,800	30,000	74,800	36,500	6.200	42.700
12 Sheldon	22,900	16,300	39,200	18,100	3,100	21,200
13 North Hilton Head	13,200	8,800	22,000	5,900	1,000	6,900
TOTAL	613,000	470,300	1,083,300	498,500	86,100	584,600

1/ Benefits - current normalized price; costs - 1975 price base.

TABLE 9-5: PL-566 WATERSHED PROJECTS
COST-SHARING

ACE BASIN

Cost Item	PL-566 Funds	Other Funds	Total
	(1975 Dollars)		
Construction	4,262,000	1,421,000	5,683,000
Engineering	301,000	-	301,000
Land Rights	-	1,162,000	1,162,000
Administration	286,000	32,000	318,000
TOTAL	4,849,000	2,615,000	7,464,000

districts' programs. The Soil Conservation Service furnishes technical assistance for planning on all land and has primary responsibility for application on cropland, pastureland and other land. Other land uses include recreation, urban, fish and wildlife and miscellaneous uses. Needs such as identification of high value wetlands, solid waste disposal, urban sediment control, animal waste disposal and similar environmental improvements add to responsibilities under this program. To accomplish the accelerated land treatment portion of the preferred plan, technical assistance to districts needs to be increased by 12 man-years annually. This is about equally divided between professional soil conservationists and technicians.

The districts' programs would be responsible for the application of the land treatment listed in Table 9-6. Other programs are also involved in the application of these practices.

Resource Conservation and Development (RC&D) Program: The RC&D program is designed to accelerate the installation of measures through group action as opposed to individual farmers as in the districts' programs. The Lowcountry RC&D Project is expected to continue in the seven county area it now serves. It is recommended that this project area be extended to include Aiken, Allendale, Bamberg, Barnwell, Calhoun and Orangeburg Counties. The RC&D program can best be utilized to fill the gap between the PL-566 watershed program and the districts' programs. Plans for the RC&D program include channel work for flood control and drainage in rural communities, critical area treatment and recreation development.

RC&D measures for flood control and drainage involve 42 rural communities. All of the measures include agricultural flood control and drainage and 23 of the measures involve built-up areas where flooding is a problem. Channels for the agricultural areas will be designed for removal of excess water based on the tolerance of crops to be grown. In built-up areas, the primary objective will be to provide a level of protection that will keep the 100-year flood out of the first floor level of homes. Table 9-7 shows the number of RC&D measures by county(ies) and their estimated costs and benefits.

RC&D funds could be used to cost share in treatment of critically eroding areas. If funds are available, an estimated $800,000 could be utilized in critical area treatment during the early action period. (See Table 8-1 for costs.)

Public recreation developments qualify for assistance under the RC&D program. For certain public water-based recreational developments, RC&D funds may be used to pay up to one-half of the cost of land rights, construction and engineering services. Of the 16 public parks in the preferred plan, it is estimated that six would qualify for RC&D cost sharing for a total federal investment of $2,915,000. (See Table 9-8 for cost sharing estimates.)

Farmers Home Administration

The Farmers Home Administration (FmHA) is authorized to make loans to develop domestic water supply and waste disposal systems for farmers and rural residents in towns of up to 10,000 people. Public or quasi-public bodies and corporations not operated for profit may

TABLE 9-6: ACCELERATED LAND TREATMENT AND TECHNICAL ASSISTANCE IN THE CONSERVATION DISTRICTS' PROGRAMS

ACE BASIN

Region/County	Treatment					Technical Assistance	
	Cropland	Grassland	Other Land	Critical Area	Total	Annual Man-Years	Annual Cost
	(Acres)						(1975 Dollars)
REGION 5							
Aiken	36,000	6,000	24,300	800	67,100	1.1	15,400
Allendale	20,500	4,200	15,900	300	40,900	0.7	9,800
Bamberg	11,700	8,000	25,100	700	45,500	0.5	7,000
Barnwell	26,600	9,200	12,300	200	48,300	0.9	12,600
Calhoun	5,600	2,100	4,600	300	12,600	0.2	2,800
Orangeburg	46,600	21,100	55,200	700	123,500	1.8	25,200
REGION 9							
Berkeley	11,300	1,800	15,000	500	28,600	0.4	5,600
Charleston	15,300	9,000	48,300	400	73,000	0.7	9,800
Dorchester	45,000	10,000	72,500	600	128,100	1.5	21,000
REGION 10							
Beaufort	7,100	6,200	33,000	70	46,370	0.3	4,200
Colleton	46,000	18,000	104,500	100	168,600	1.6	26,600
Hampton	6,200	4,000	44,100	150	54,450	0.3	4,200
Jasper	18,400	3,800	56,000	80	78,280	0.6	8,400
OTHER							
Edgefield	8,300	1,400	2,300	80	12,080	0.3	4,200
Lexington	40,600	4,200	7,900	630	53,330	1.2	16,800
Saluda	3,800	600	900	90	5,390	0.2	2,800
TOTAL	349,000	109,500	521,900	6,100	986,100	12.3	176,400

TABLE 9-7: CHANNEL WORK
RC&D MEASURES

ACE BASIN

Region/County	Measures (No.)	Problem Area (Acres)	Proposed Channel Work (Miles)	Benefited Area (Acres)	Total Installation Cost	Annual Cost: Installation	Annual Cost: Operation & Maintenance	Annual Cost: Total	Annual Benefits
					(Dollars) 1/				
REGION 5									
Allendale	3	21,500	48	10,510	788,000	52,600	9,900	62,500	88,100
Bamberg	3	23,000	53	13,780	863,000	57,600	10,000	67,600	98,800
Barnwell	2	4,200	9	2,130	150,000	10,000	1,600	11,600	16,200
Orangeburg	7	10,690	44	6,060	724,000	48,400	6,400	54,800	64,900
REGION 9									
Berkeley	2	42,600	107	20,170	1,752,000	117,000	19,600	136,600	195,400
Dorchester	4	16,300	57	9,450	928,000	62,000	8,400	70,400	83,500
Charleston	4	38,500	72	20,570	1,170,000	78,100	13,500	91,600	132,900
REGION 10									
Beaufort	5	34,900	100	25,360	1,630,000	108,900	19,500	128,400	191,500
Colleton	4	45,650	130	26,470	2,122,000	141,700	24,400	166,100	237,600
Hampton	3	38,000	73	20,620	1,185,000	79,100	13,600	92,700	138,400
Jasper	5	28,900	97	18,830	1,586,000	105,900	18,200	124,100	186,400
TOTAL	42	304,240	790	173,950	12,898,000	861,300	145,100	1,006,400	1,433,700

1/ Price base: benefits - current normalized prices; costs - 1975 prices; annual costs amortized at 6 3/8 percent interest for 50 years.

TABLE 9-8: RC&D MEASURES
COST SHARING

ACE BASIN

Item	RC&D Funds (1975 Dollars)	Other Funds	Total
Channel Work			
Construction	7,487,000	2,496,000	9,983,000
Engineering	491,000	-	491,000
Land Rights	-	1,928,000	1,928,000
Administration	446,000	50,000	496,000
	8,424,000	4,474,000	12,898,000
Recreation			
Construction	2,406,000	4,495,000	6,901,000
Engineering	59,000	140,000	199,000
Land Rights	434,000	1,442,000	1,876,000
Administration	16,000	65,000	81,000
	2,915,000	6,142,000	9,057,000
Critical Areas			
Treatment	800,000	1,050,000	1,850,000
	800,000	1,050,000	1,850,000

receive financial and technical assistance in planning, developing, improving and extending water and waste disposal systems. Loan funds may be used to: (1) install, repair, improve or expand rural water supply reservoirs, pipe lines, wells, pumping plants and water filtration and treatment facilities; (2) purchase a water supply or a water right; (3) install, repair, improve or expand waste collection, treatment or disposal systems; (4) pay necessary fees; and (5) pay other costs related to the improvements, including the acquisition of rights-of-way and easements and the relocation of roads and utilities. The goal of the Farmers Home Administration is to provide loans to all eligible communities for the installation of water supply and waste disposal systems.

Twenty-nine communities have indicated that they plan to install or expand water supply and distribution systems. Fifty-one communities plan to install or improve wastewater treatment systems. Most of this work would be eligible for Farmers Home Administration loans, if funds are available.

Farmers Home Administration loans may be utilized to pay the local share of most of the watershed projects and the RC&D measures. These loans are usually made to watershed conservation districts and are repaid by a tax levy from landowners. Loans to individual farmers for the installation of conservation practices are also important. Many of the practices such as on-farm drainage systems, erosion control practices and forestry practices are eligible.

Recreational developments may qualify for Farmers Home Administration loans. These loans may be used for a wide variety of recreational facilities, as well as for land purchase. Interest rates are usually favorable for community development loans.

Forest Service

Cooperative Forest Management (CFM): A majority of forestry practices in the preferred plan will fall within provisions of the Cooperative Forest Management Act of 1950. Employment of five professional foresters and four forestry technicians will provide manpower needed to accomplish goals set up for improving production efficiency. The remainder of the preferred plan requires the services of four additional foresters and three forestry technicians.

General Forestry Assistance (GFA): Employment of specialists in marketing and utilization will insure recovery of large quantities of wood fiber now left in the woods during harvesting. The GFA program can be used to carry out this phase of the preferred plan. These specialists, as professional foresters, work in coordination with foresters working under the Cooperative Forest Management Program. To carry out recovery of wood residues and logging wastes, three specialists and three utilization technicians are needed to provide technical assistance.

Cooperative Forest Fire Control (CM-2): Intensive application of wildfire prevention is essential to reduction in timber losses caused by uncontrolled fires. Under the CM-2 program, two man-years of professional assistance and five man-years of fire control technical

assistance will provide the support needed to implement this phase of the basin plan.

Thinning over-stocked pine stands is essential to full production in South Carolina pine forests.
(Photograph courtesy of South Carolina State Commission of Forestry)

Forest Insect and Disease Management (FI&DM): This program is designed to help reduce wood volume and grade losses caused by insect and disease attacks. An entomologist/pathologist and two biological technicians are needed for this program.

Agricultural Conservation Program

The Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service provides funds for cost-sharing with individual landowners and operators for the installation of conservation practices. The ACP may cost share up to one-half of the cost of certain practices for eligible landowners. If the ACP is to be effective in the accelerated land treatment program, additional federal funds must be made available. An accelerated annual input of one million dollars is needed.

ACP practices are designed for erosion control, development of the forest resource base, conservation of water, development of wildlife habitat, pollution reduction and improved farm income. The

most needed practices are listed below:

- Establising grasses
- Surface and subsurface drains
- Land grading and smoothing
- Terraces and diversions
- Stripcropping
- Grade stabilization structures and debris basins
- Ponds
- Tree planting
- Timber stand improvement
- Wildlife habitat development

Forestry Incentives Program

The Forestry Incentives Program (FIP), administered by the Agricultural Stabilization and Conservation Service, offers cost sharing for tree planting and improving a stand of forest trees. The primary purpose of this program is to assist the small forest landowner, on a cost-share basis, with his efforts to produce marketable timber crops.

Environmental Impacts

Quality of Land, Water and Air: The accelerated land treatment program, when implemented, will reduce soil erosion. Treatment of cropland will result in a reduction of sheet erosion which will prolong the usefulness of the land resources. Treatment of critically eroding areas will help prevent the loss of soil from gullied areas, roadsides, galled areas and construction sites. There is a direct relationship between soil loss and sediment delivered to streams. As erosion is reduced, sediment problems are also reduced. The land treatment program will result in a reduction of sediment accumulations throughout the basin. The most notable effects will be in tributaries to the major drainage channels. The reduction of sediment in these areas will have a significant impact on improvement of water quality, channel capacity and fishery habitat.

Treatment of forest land and pastureland will help improve ground cover which will improve infiltration of water into the soil, thereby reducing runoff and decreasing soil erosion.

Construction of channels will allow removal of excess water from the land. As proposed in the preferred plan, the channels will remove floodwater and provide drainage outlets, allowing corn and soybeans to be grown on land currently restricted to use as pasture due to wetness problems. Water level control in forest land is planned for pine sites and will be adequate for regeneration, improved growth and access for harvesting.

During and immediately after drainage canal construction, sediment from loosened soil will move downstream during periods of heavy rainfall. Where practical, sediment traps will be installed near the outlet ends of the canals to remove heavy sediment particles from the water and prevent delivery into the main watercourses.

Open ditches remove floodwater and provide drainage for all land uses.

Treatment of wastewater by communities in the basin will improve the quality of water returned to the streams.

Prescribed burning of pine forest stands will create smoke, fumes and chemicals in the air near areas burned for short periods; however, prescribed burning will decrease the threat of wildfires which create a much greater volume of air pollutants.

Fish and Wildlife: Improved forest management will help to protect and improve wildlife habitat. Well planned harvesting cycles and management will help prevent total changes in habitat types and disruption of wildlife populations. Preservation of trees along streams will help maintain shade for maintenance of water temperature.

Treatment practices on cropland such as field borders, windbreaks and seeding of channel rights-of-way will create habitat for quail and other wildlife species. Removal of hedgerows for more efficient use of equipment will reduce wildlife habitat.

Improved grasses and management of pastures will tend to improve wildlife food. Pond construction will create fish habitat as well as provide an additional source of water for wildlife.

Drainage canal construction will result in the clearing of 5,100 acres of forest land which will alter wildlife habitat. Part of this loss will be recovered by the creation of additional edge which favors quail and other species.

Even though careful consideration is given to avoid drainage of

high value wetlands, a few areas will be affected by canal construction. Sediment created during construction will adversely affect fish habitat for a short period.

Field borders help reduce erosion and provide habitat for wildlife.

Archeological and Historical: No archeological or historical sites were identified in any of the project areas by the limited studies made during plan formulation. However, before any construction is started, detailed studies will be made of areas affected by project construction.

Economic and Social: Employment opportunities will be increased through improved agricultural production resulting from project installation. Living conditions will be improved by the removal of excess water from residential and business areas, by the installation of water systems and by improvements in wastewater treatment. Increased farm incomes will result in improved living standards among the farm population. The additional growth of trees will help insure a steady supply of forest products into the future.

As job opportunities are improved, out-migration should tend to decrease.

Floodwater damages will be reduced substantially on cropland, forest land, pastureland and in built-up areas. Other effects will include reduced breeding places for mosquitoes and other insects, more efficient operation of septic tank disposal systems and improved highway safety.

Recreational facilities will improve opportunities for residents

of the basin and will tend to draw people from other areas into the basin, resulting in improved income in local areas.

The annual yield of wood fiber will be increased 35.7 million cubic feet by 1990. This increased production will require increased nursery stock at the state nurseries and large amounts of fertilizer. Heavy equipment and tree planting machines must also be available.

Restrictions on timber harvesting will reduce the amount of wood products delivered to markets.

Visual Quality: During timber harvesting operations, buffer strips of trees will be left along highways to maintain a more natural scene. Treatment of critically eroding areas such as galls, gullies, mines and roadsides will result in a more pleasing landscape.

Favorable Environmental Effects

Floodwater and drainage problems will be reduced on 490,000 acres of agricultural and forest land and in 54 built-up areas.

Soil erosion will be reduced by one million tons annually.

Appearance of the landscape will be improved by treating critically eroding areas.

Sediment reduction will result in improved water quality, reduced flooding and a more stable fishery habitat.

Water quality will be improved through treatment of wastewater.

Wildfires will be reduced.

Wildlife habitat will be improved through improved forestry and agricultural practices.

Recreational opportunities will be increased through park development.

Adverse Environmental Effects

Installation of the canals and recreation lakes will require clearing of 5,100 acres of forest land. About 850 acres will be covered with water. Noise and dust pollution will be increased and the ambient air quality will be lowered during the construction period. Sediment movement in streams will be increased during construction and for a short period thereafter while vegetation is being established. Traffic congestion will increase around recreation areas.

Alternatives

Chapter 7 discusses alternatives to the preferred plan. The National Economic Development Alternative includes more structural measures that might increase adverse environmental impacts. The Environmental Quality Alternative includes fewer structural measures and more nonstructural measures, such as flood proofing, land use regulations and restricted use of resources. Other alternatives might include public purchase of high value wetlands, archeological sites, historical sites and habitat for threatened and endangered species.

Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance of Long-Term Productivity

When the basin as a whole is considered, there are trade-offs among environmental values. When given amounts of agricultural goods are to be produced, there is a choice of producing on sloping land where erosion is a problem or on flat land where flood control and drainage are required. The preferred plan is a compromise between the choices. It proposes flood control and drainage of the most feasible areas, allowing the most erosive land to be used less intensively. Even with less intensive use, flat lands will continue to produce crops over an indefinite period of time.

Irreversible or Irretrievable Commitment of Resources

Installation of the channels will require clearing 5,100 acres of forest land. Most of this will be kept open throughout the life of the projects. About 850 acres of land will be covered with water in the recreation lakes. The labor, materials and energy required to install the measures cannot be retrieved.

Display of Accounts

A display of accounts has been prepared to show USDA opportunities in the preferred plan. Cost estimates are based on costs of recently constructed projects and have 1975 as their base year. Costs are amortized over 50 years at an interest rate of 6-3/8 percent. Beneficial and adverse effects, when given a monetary value, are measured in average annual dollars. All nonagricultural effects are based on 1975 prices, while agricultural effects are based on current normalized prices.

USDA OPPORTUNITIES IN THE PREFERRED PLAN

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measures of effects (Average Annual) 1/
Beneficial Effects	
Value to users of increased outputs of goods and services	
1. Agricultural flood prevention and drainage and improved efficiency	$ 7,843,000
2. Nonagricultural flood prevention	459,000
3. Recreation	983,000
4. Water supply and distribution	3,636,000
5. Water quality improvement	5,307,000
6. Utilization of unemployed and underemployed labor resources	
a. construction	482,000
b. OM&R	123,000
Total Beneficial Effects	$18,833,000

Components	Measures of effects (Average Annual) 2/
Adverse Effects	
Value of resources required for a plan	
1. Agricultural outlet channels and on-farm systems	
a. installation costs	$ 3,430,000
b. OM&R costs	771,000
2. Nonagricultural outlet channels	
a. installation costs	146,000
b. OM&R costs	24,000
3. Flood proofing and relocation	94,000
4. Recreational development	
a. installation costs	605,000
b. OM&R costs	210,000
5. Water supply and distribution	
a. installation costs	3,056,000
b. OM&R costs	400,000
6. Wastewater treatment	
a. installation costs	4,007,000
b. OM&R costs	1,000,000
7. Project administration	643,000
Total Adverse Effects	$14,386,000
Net Beneficial Effects	$ 4,447,000

1/ Agricultural benefits, current normalized; all other, 1975.
2/ 1975 price base, costs amortized at 6 3/8 percent interest for 50 years.

USDA OPPORTUNITIES IN THE PREFERRED PLAN

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Areas of natural beauty	1. Improved selection and management of 16 waste disposal sites.
	2. Maintenance of maximum forest cover on 50,000 acres by limiting harvest to standard rotation.
	3. Reforestation of 110,000 acres.
	4. Restriction of tree harvests to protect 50,000 acres of visual corridors and buffer strips.
	5. Reduce erosion on 400,000 acres as a result of land treatment.
	6. Reduce sediment delivery into lakes and streams.
	7. Create 850 acres of lakes and ponds with 80 miles of shoreline.
	8. Installation of 1,232 miles of main outlet channels will change the natural vegetation along rights-of-way.
B. Quality considerations of land, air and water resources	1. Erosion control practices on 400,000 acres of eroding land will improve land and water quality.
	2. Timing of prescribed burning and forest fire prevention will reduce air pollution.
	3. Flood prevention measures will decrease land damage on 373,600 acres.
	4. Upgrading of 51 sewage treatment plants will decrease the discharge of raw or partially treated sewage into the basin's watercourses.
	5. Buffer strips of forest cover left along streams will decrease chances of stream ecosystem degradation.
	6. Creation of 600 lakes will inundate 850 acres of land.
	7. Reduce land required to produce crops by 15,500 acres.
	8. Windbreaks, hedgerows and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.
	9. Assistance to loggers and timber buyers will result in better utilization of harvested timber and woods waste.
	10. Channel construction can degrade water quality especially during construction.
C. Biological resources and selected ecosystems	1. Improved fish pond management on 850 ponds and construction and stocking of 600 ponds.
	2. Reduction of stream pollution will improve and protect fishery habitat.
	3. Field border plantings, hedgerow plantings, channel rights-of-way plantings and cropland multiple use will benefit numerous wildlife species by providing food and cover and increase edge habitat.
	4. Reforestation of 110,000 acres of forest land can increase wildlife habitat for certain species.
	5. Prescribed burning of 500,000 acres of forest land will increase deer browse and native quail foods.
	6. Maintaining hardwood stands to provide mast will increase habitat variability.
D. Archeological and historical	No archeological or historical sites have been identified in the areas where work is planned. More detailed studies and plans for preservation will be made before construction is started.
E. Irreversible or irretrievable commitments	1. Creation of 600 lakes will inundate 850 acres of land.
	2. Channel work will result in clearing 5,100 acres of woods that will be replanted to grass.

USDA OPPORTUNITIES IN THE PREFERRED PLAN

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of effects: State of South Carolina	Measures of effects: Rest of Nation
Income:	(Average Annual) 1/	
Beneficial Effects		
A. Value of increased output of goods and services to users residing in the region		
1. Flood prevention and drainage and improved efficiency	$ 8,302,000	-
2. Recreation	833,000	$ 150,000
3. Water supply and distribution	3,636,000	-
4. Water quality improvement	5,307,000	-
5. Utilization of unemployed and underemployed labor resources		
a. construction	482,000	-
b. OM&R	123,000	-
B. Value of output to users residing in the region from external economies		
indirect activities associated with increased returns from drainage and flood prevention	5,801,000	-
Total Beneficial Effects	$24,484,000	$ 150,000
Adverse Effects		
Value of resources contributed from within the region to achieve the output		
1. main outlet channels and on-farm systems		
a. installation cost	$ 1,299,000	$ 2,277,000
b. OM&R cost	795,000	-
2. flood proofing and relocation	94,000	-
3. recreation development		
a. installation cost	410,000	195,000
b. OM&R cost	210,000	-
4. water supply and distribution		
a. installation cost	3,056,000	-
b. OM&R cost	400,000	-
5. wastewater treatment		
a. installation cost	4,007,000	-
b. OM&R cost	1,000,000	-
6. project administration	161,000	482,000
Total Adverse Effects	$11,432,000	$ 2,954,000
Net Beneficial Effects	$13,052,000	$-2,804,000

Components	Measures of effects: State of South Carolina	Measures of effects: Rest of Nation
Employment:	(Average Annual) 1/	
Beneficial Effects		
Increase in the number and types of jobs		
1. agricultural employment	472 permanent jobs in agricultural production	-
2. employment in recreation services sector	66 permanent jobs and 23 part-time jobs in recreational services	-
3. employment for project construction	2,106 man-years of employment for construction	-
4. employment for project OM&R	202 permanent semi-skilled and unskilled jobs for OM&R	-
Total Beneficial Effects	740 permanent jobs, 23 part-time jobs and 2,106 man-years of employment for construction	-
Adverse Effects	-	-
Net Beneficial Effects	740 permanent jobs, 23 part-time jobs and 2,106 man-years of employment for construction	-
Population Distribution:		
Beneficial Effects	Creates 740 permanent jobs, 23 part-time jobs and 2,106 man-years of employment for construction in an area that has experienced out-migration during the past two decades	-
Adverse Effects	-	-
Regional Economic Base and Stability:		
Beneficial Effects	Provides flood reduction and drainage to an area that is expected to remain in agriculture	-
Adverse Effects	-	-

1/ Agricultural benefits, current normalized; all other, 1975.

USDA OPPORTUNITIES IN THE PREFERRED PLAN

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and Adverse Effects	
A. Real Income Distribution	1. Creates 740 low to medium income jobs, 23 part-time jobs and 2,106 man-years of employment for area residents.
	2. Create regional benefits distribution of $24,484,000 by income class as follows:

Income Class ($)	% of Families in Income Class	% Benefits in Class
Less than $3,000	18.4	20
$3,000 - 10,000	49.7	50
More than $10,000	31.9	30

3. Local costs to be borne by region total of $11,132,000 with distribution by income class as follows:

Income Class ($)	% of Families in Income Class	% Contributions in Class
Less than $3,000	18.4	15
$3,000 - 10,000	49.7	50
More than $10,000	31.9	35

Components	Measures of effects
Beneficial and Adverse Effects	
B. Life, Health and Safety	1. Provides flood damage reduction to homeowners in 54 communities.
	2. Reduces insect breeding areas by removal of water in built-up areas.
C. Recreational Opportunities	Creates 526,000 visitor-days of recreational opportunities

CHAPTER 10 - COORDINATION AND PROGRAMS FOR FURTHER DEVELOPMENT

Continued cooperation is essential among all agencies involved in water resource conservation and development activities. Coordinated planning efforts can help to avoid conflicts among users of the basin's resources. The preferred plan outlines the measures that the basin's residents desire to accomplish during the next 15-20 years. Chapter 9 shows how the USDA programs could help to accomplish the plan. This chapter identifies measures in the preferred plan that could be accomplished by individuals, groups, organizations, local governments, councils of government, state agencies and federal agencies other than USDA.

Nonstructural

Many of the environmental concerns are treated with nonstructural measures which require regulations for conservation or protection of these values.

Land Use Regulations: Counties, in cooperation with municipalities, councils of government and state agencies must take the leadership in land use planning and implementation of land use regulations where they are needed. Zoning and other regulations are necessary in certain areas to protect property owners from suffering floodwater losses and for more orderly development of their resources. Often certain regulations are required before an area is eligible for flood insurance. Flood hazard information may be furnished through programs of the U.S. Department of Housing and Urban Development.

Flood Proofing and Relocation: In areas subject to flooding where homes or other buildings have been constructed, flood proofing and relocation may be the most practical solution to reducing floodwater damages. Flood hazard analysis under USDA, U.S. Geological Survey and the U.S. Army Corps of Engineers can be most effective in preventing future increases in flood damages, especially when these programs are supported by land use regulations. Usually individuals, groups or municipal governments are responsible for flood proofing and relocating their buildings. An estimated 450 homes and businesses will be flood proofed or relocated during the early action period.

Protection of Wildlife Habitat: All agencies have responsibilities in protection and development of wildlife habitat. The South Carolina Wildlife and Marine Resources Department is the most logical agency to lead this work. To accomplish the task, this Department needs to expand its services to include work on individual properties. As

increased hunting demands add pressure to this limited resource, expansion of the state controlled hunting areas will be desirable.

Cooperation of individual landowners and others will be required to modify tree harvest in areas of significant wildlife habitat. As conservationists assist landowners in land use decisions, they should encourage the preservation of hedgerows and other wildlife areas.

Protection of Wetlands: Responsibility for protection of wetlands falls upon the state. Reasonable laws and regulations will need to be enacted to identify and protect the most valuable areas of wetlands. Cooperation by all agencies and county governments is necessary. It is important that the state enact a Coastal Zone Management Plan, so that citizens will have a guide to development of the coastal area. One of the early actions should be the identification of areas with high value that will be protected.

Pollution Control: Much has been accomplished toward the reduction of pollution. Improved land treatment and use, regulation of waste disposal in waterways and many other advances have been made. The non-point pollution studies being made by the councils of government and the South Carolina Department of Health and Environmental Control will identify other sources of pollution. Plans will need to be made by communities to combat these problems. Improvements are in order in the disposal of solid waste. The USDA Plan called for location of sites for solid waste disposal. It will be up to communities to follow through with completion of this task. The U.S. Army Corps of Engineers, through its permit system, assists in pollution control.

Waterfowl Habitat: Some of the most valuable waterfowl areas are the old rice fields near the coast. Some of these can be managed by individual property owners. Others will need to be managed by state agencies or county governments.

Threatened and Endangered Species: Environmental organizations are active in the preservation of threatened and endangered species of plants and animals. Funds are needed from state or other sources for location and in some cases, purchase of property for assurance that the most valuable habitat areas are preserved. An estimated 10 sites will need to be preserved in the basin.

Wild and Scenic Rivers: Greater cooperation by organizations, local governments and individuals is essential to make the state Wild and Scenic River Program a reality. It may be necessary to appropriate public funds for puchase of easements for the Wild and Scenic River Program. An estimated 100 miles of river is a reasonable goal for the early action period.

Archeological and Historical: State agencies, councils of government and interested organizations need to cooperate in the identification and protection of archeological and historical resources. Public funds will be needed to purchase some of the most valuable sites to

prevent their deterioration or destruction.

Any plan should include preservation of archeological and historical values.

Land Treatment

USDA programs are planned to furnish accelerated technical assistance for installing land treatment practices and for conservation planning assistance. Some funds are planned for cost-sharing assistance. This leaves the job of decision making and installation to landowners or operators. To accomplish the plans for land treatment, farmers must make land use adjustments and finance changes in land use. An education program is an essential element in accomplishing desired changes.

State and federal agencies will work together to provide assistance in management of wildlife areas, stocking ponds with fish and protecting environmental values.

Timber companies and other land holding groups or individuals are expected to provide important contributions to protection of resources, especially wildlife and other values associated with forest land.

This fire plow is one of the first pieces of equipment to reach the fire scene. A wild fire, once detected, is attacked by fire crews from either the South Carolina State Commission of Forestry or industrial timber companies; or both when maximum manpower is required in extremely large fires.
(Photograph courtesy of South Carolina State Commission of Forestry)

Critical Area Treatment: The South Carolina Highway Department and county road departments will provide a major share of the roadside erosion control program in the plan. Landowners and operators will provide at least one-half of the cost of treatment of gullies, galls and old mines.

Counties and municipalities must cooperate with developers and others in treating construction sites to prevent sediment damages downstream.

The U.S. Army Corps of Engineers in cooperation with individual property owners, counties and state agencies will plan for treatment of eroding beaches. Eight problem areas were identified. Severe problems may develop in other areas over time and will require action.

Clemson University is expected to assist in the design and installation of irrigation systems to be installed by farmers in the basin. The Clemson University Extension Service is expected to make the major educational contribution for carrying out plans for increased agricultural production.

Structural Measures

USDA programs can assist in planning, designing and financing some of the structural measures. Initiative by individuals, groups, organizations, counties, municipalities and state agencies is the key to success of any of the projects or programs.

Channels: Projects proposed under Public Law 566 will require the sponsorship of a watershed conservation district or some other legal organization. The sponsors will be responsible for planning, financing, acquiring land rights, contracting, assisting in installation and operating and maintaining projects.

Measures proposed under the RC&D Program will require the same degree of sponsorship as the PL-566 projects even though RC&D measures are often on a smaller scale.

Cities and towns are responsible for the installation of flood control structures in their built-up areas. These structures include storm drains and collector systems. Local governments may receive loans or grants from federal agencies for this work.

The U.S. Army Corps of Engineers can assist local governments with their flood control projects through their local protection authorities.

Water Supply and Distribution: Cities, towns and rural communities must make long range plans to meet their water needs. They must agree on the location of future development and work out methods of financing. Councils of government will provide important planning assistance to these areas. Grants and loans may be available from other federal agencies.

Recreation: The South Carolina Department of Parks, Recreation and Tourism has leadership for the state park system. The counties and cities are taking a more active role in providing recreational areas. The U.S. Bureau of Outdoor Recreation provides funds for cost-sharing with the state for recreation. The U.S. Department of Interior also assists in the recreational programs. USDA can assist in only a minor part of the recreation plans for the basin.

A major portion of the recreational needs will be met from outside the governmental agencies. Individuals, organizations and groups will provide recreational areas and facilities for use by their members or as profit-making ventures.

Wastewater Treatment: Towns and cities usually have the legal power to raise funds, acquire land and provide the necessary leadership needed to install their needed facilities. Rural areas that need wastewater treatment facilities often need to organize into public service districts or some other legal organization before they can borrow funds and install their needed facilities. Federal agencies, such as the Department of Housing and Urban Development might have funds available for assisting towns and cities in financing and planning their installations.

Expansion of Programs: It is recommended that the Lowcountry Resource Conservation and Development (RC&D) Area be expanded to include the six counties in Region 5. These counties are Aiken, Allendale, Bamberg, Barnwell, Calhoun and Orangeburg.

Long-Term Plan

The long-term plan is designed to accomplish identified needs that will not be met by the preferred plan by 1990 and the going programs by the year 2020. This plan is stated in general terms with the realization that long range plans require constant revision to adjust for population shifts, new technology, economics and other conditions. The long-term plan is an extension of the preferred plan and is designed to meet 2020 needs after the preferred plan is installed and going programs have made their contribution. Most of the elements included in the preferred plan will require maintenance during the long-term planning period. Table 10-1 shows the remaining needs if no plan is in effect and plan elements to meet these needs. Table 10-2 shows the expected land use and erosion rates by the year 2020. Table 10-3 shows production data for major crops during the long-term planning period including acres, average yields per acre and total production.

TABLE 10-1: LONG-TERM PLAN FOR MEETING 2020 NEEDS

ACE BASIN

Page 1 of 4

Remaining Needs	Unit	Amount	Plan Elements	Unit	Long-Term Plan Amount
Erosion Damage Reduction and Increased Production Efficiency					
Cropland	Ac.	495,700			
			A. Terraces & waterways	Ac.	8,000
			B. Waterways & contour farming	Ac.	40,000
			C. Minimum tillage	Ac.	200,000
			D. Grass based rotations	Ac.	6,000
			E. Wind erosion control	Ac.	20,000
			Irrigation	Ac.	20,000
			Shift from forest to crops	Ac.	20,000
Pastureland	Ac.	140,000			
			Pasture & hayland planting	Ac.	120,000
			Improved management	Ac.	140,000
			Ponds	No.	200
Forest land	Ac.	1,725,500			
			Reforestation	Ac.	183,000
			Timber stand improvement	Ac.	210,400
			Utilization & marketing	Cu.Ft.	103,600,000
			Prescribed burning	Ac.	500,000
			Mortality reduction	Cu.Ft.	1,900,000
			Fertilization	Ac.	1,072,900
			Improved logging roads and skid trails	Mi.	100

TABLE 10-1: LONG-TERM PLAN FOR MEETING 2020 NEEDS

ACE BASIN

Remaining Needs	Unit	Amount	Plan Elements	Long-Term Plan Unit	Long-Term Plan Amount
Floodwater Damage Reduction and Drainage on Agricultural and Forest Land	Ac.	427,700			
			Major outlet channels	Mi.	480
			On-farm systems:		
			cropland	Ac.	20,000
			pastureland	Ac.	30,000
			forest land	Ac.	50,000
			other land	Ac.	5,000
Nonagricultural Floodwater Damage Reduction					
Homes & businesses	No.	1,750			
			Flood proofing or relocating homes	No.	550
			Outlet channels	Mi.	188
Improved Water Supply and Distribution Systems					
Water supply	MGD	23.5			
			Wells	MGD	23.5
Irrigation	Ac.Ft.	10,000			
			Ponds	Ac.Ft.	10,000

TABLE 10-1: LONG-TERM PLAN FOR MEETING 2020 NEEDS

ACE BASIN

Remaining Needs	Unit	Amount	Plan Elements	Long-Term Plan Unit	Long-Term Plan Amount
Increased Public Recreational Areas	No.	8			
			Public areas	No.	8
			Forest multiple use (for recreation)	Ac.	10,000
Critical Erosion Damage Reduction					
Road areas	Ac.	200	Treatment of road areas	Ac.	200
Construction sites	Ac.	1,000	Treatment of construction sites	Ac.	1,000
Galled areas	Ac.	120	Treatment of galled areas	Ac.	100
Old mines	Ac.	1,032	Treatment of old mines	Ac.	1,000
Beaches	No.	4	Treatment of beaches	No.	4
	Mi.	12		Mi.	12
Solid Waste Disposal Areas	No.	16		No.	16
Improvement of Natural Beauty	Ac.	70,000			
			Wild & scenic rivers	Mi.	150
			Maintain maximum forest cover	Ac.	50,000
			Design harvest patterns	Ac.	35,000
			Reduce wildfires	Ac.	17,600

TABLE 10-1: LONG-TERM PLAN FOR MEETING 2020 NEEDS

ACE BASIN

Remaining Needs	Unit	Amount	Plan Elements	Long-Term Plan Unit	Long-Term Plan Amount
Wildlife Area Improvement	Ac.	80,000			
			Wildlife area & field border plantings	Ac.	10,000
			Modified silvicultural practices	Ac.	70,000
			Maintenance of hardwood timber types	Ac.	200,000
Fish Habitat Improvement	Ac.	2,000			
			Pond construction	No.	100
			Fish pond improvement	Ac.	2,000
Preservation of Habitat for Threatened and Endangered Species (Sites)	No.	0			
			Site identification & selection		continuing
Protection of Wetlands	Ac.	0			
			Wetlands		continuing
Protection of Archeological and Historical Sites	No.	0			
			Site protection		continuing

TABLE 10-2: PROJECTED LAND USE AND EROSION RATES BY 2020

ACE BASIN

Land Use	Amount (Thousand Acres)	Erosion Rate (Tons Per Acre)
Planted Cropland	720	6.1
Hayland and Pasture	350	0.2
Idle Cropland and Pasture	100	0.4
Forest Land	2,790	0.02
Water	160	0.0
Other Land	360	1.0

TABLE 10-3: PRODUCTION DATA FOR MAJOR CROPS BY 2020

ACE BASIN

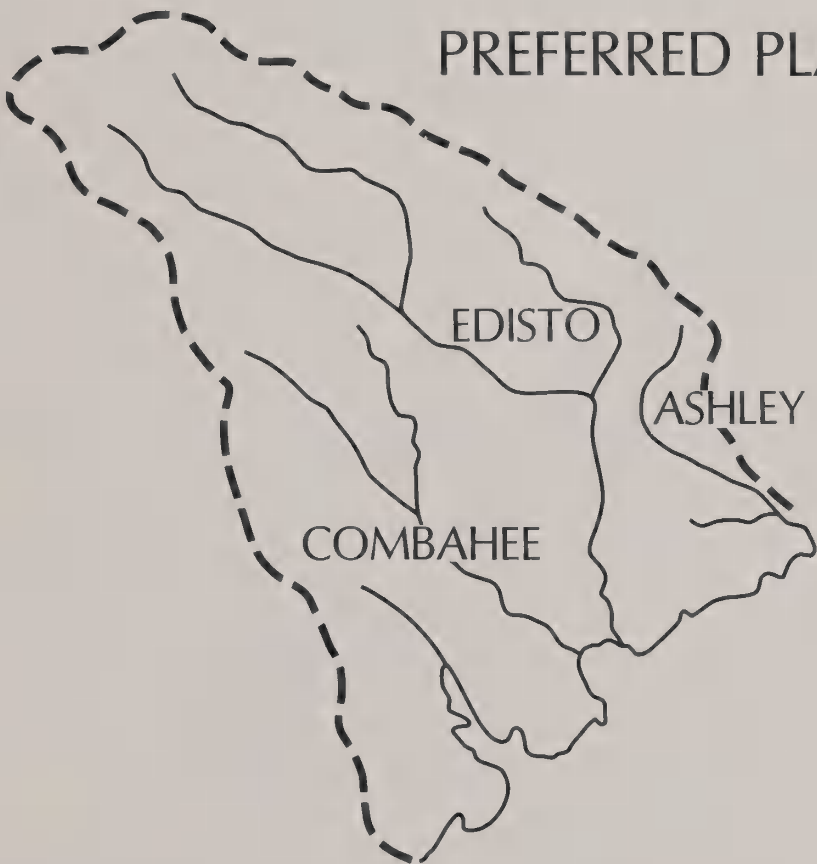
Crops	Acres	Average Yield Per Acre	Production (1,000)
Cotton	28,200	597 lbs.	16,840 lbs.
Corn	314,200	87 bu.	27,200 bu.
Wheat	11,500	57 bu.	652 bu.
Oats	2,500	66 bu.	165 bu.
Barley	17,500	69 bu.	1,215 bu.
Roughage	350,800	3 tons	1,000 tons
Soybeans	256,100	40 bu.	10,244 bu.
Tobacco	300	3,390 lbs.	1,017 lbs.
Peanuts	4,300	3,372 lbs.	16,050 lbs.
Peaches	1,100	189 bu.	208 bu.
Tomatoes	3,200	7 tons	22 tons

ACE RIVER BASIN STUDY

SOUTH CAROLINA

WATER AND LAND RESOURCES

PREFERRED PLAN



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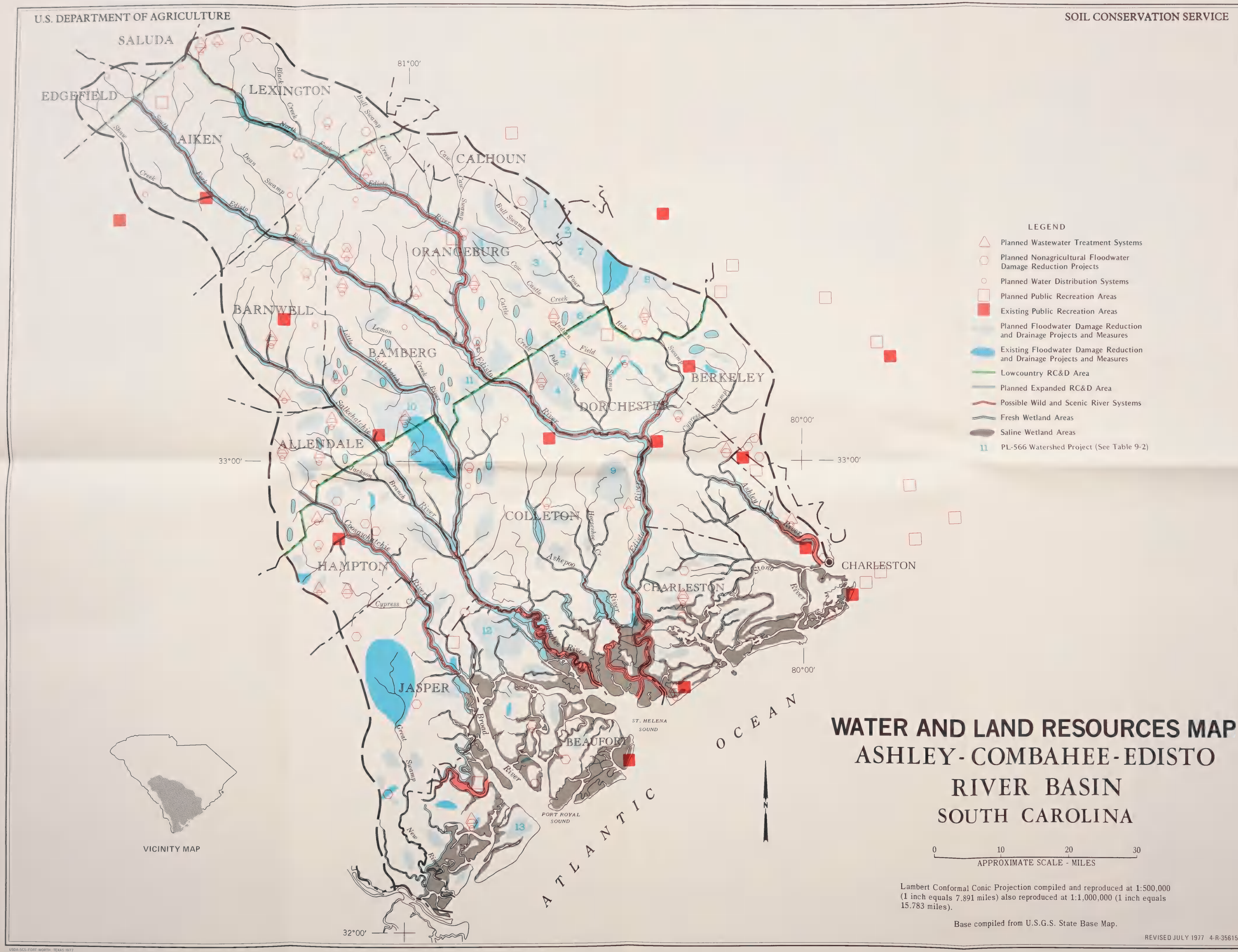
1976


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SALUDA
EDGEFIELD
LEXINGTON
AIKEN
CALHOUN
ORANGEBURG
BARNWELL
BAMBERG
BERKELEY
DORCHESTER
ALLENDALE
COLLETON
HAMPTON
CHARLESTON
CHARLESTON
JASPER
BEAUFORT
ST. HELENA SOUND
PORT ROYAL SOUND
ATLANTIC OCEAN
81°00′
80°00′
33°00′
32°00′
LEGEND
Planned Wastewater Treatment Systems
Planned Nonagricultural Floodwater Damage Reduction Projects
Planned Water Distribution Systems
Planned Public Recreation Areas
Existing Public Recreation Areas
Planned Floodwater Damage Reduction and Drainage Projects and Measures
Existing Floodwater Damage Reduction and Drainage Projects and Measures
Lowcountry RC&D Area
Planned Expanded RC&D Area
Possible Wild and Scenic River Systems
Fresh Wetland Areas
Saline Wetland Areas
11 PL-566 Watershed Project (See Table 9-2)
VICINITY MAP
WATER AND LAND RESOURCES MAP
ASHLEY - COMBAHEE - EDISTO
RIVER BASIN
SOUTH CAROLINA
0 10 20 30
APPROXIMATE SCALE - MILES
Lambert Conformal Conic Projection compiled and reproduced at 1:500,000 (1 inch equals 7.891 miles) also reproduced at 1:1,000,000 (1 inch equals 15.783 miles).
Base compiled from U.S.G.S. State Base Map.
REVISED JULY 1977 4-R-35615
SEPTEMBER 1976 4-R-26010-B

APPENDICES

ACE RIVER BASIN STUDY

SOUTH CAROLINA

WATER AND LAND RESOURCES

U.S. DEPARTMENT OF AGRICULTURE

ECONOMIC RESEARCH SERVICE
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1977

APPENDICES

ACE RIVER BASIN
COOPERATIVE STUDY

WATER AND LAND RESOURCES

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE
SOIL CONSERVATION SERVICE

in cooperation with
THE SOUTH CAROLINA WATER RESOURCES COMMISSION

1977

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INTRODUCTION

The Ashley-Combahee-Edisto (ACE) Basin Study is being made according to Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (PL-566, as amended). The South Carolina Water Resources Commission represents the State and coordinates the study.

The Main Study Report is published in a separate volume. It contains an assessment of present and future conditions, a description of basin problems and needs, a presentation of alternative solutions, a recommended plan to satisfy the needs and opportunities for implementation.

These Appendices supplement the Main Report.

APPENDIX A: SOIL ASSOCIATIONS INTERPRETATIONS 1/

ACE BASIN

Soil interpretations are useful for providing information about the soil resources in the basin. The information can be used for broad, general land use planning of large areas and can assist with the planning and development of major parts of the basin.

Definitions of soil limitations are as follows 2/:

None to Slight	Soils have properties favorable for the rated use. Limitations are so minor that they can be easily overcome. Good performance and low maintenance can be expected from these soils.
Moderate	Soils have properties moderately favorable for the rated use. Limitations can be overcome or modified with planning, design, or special maintenance.
Severe	Soils have one or more properties unfavorable for the rated use. Limitations are difficult and costly to modify or overcome, requiring major soil reclamation, special design, or intense maintenance.

For some uses, an additional breakdown of the severe rating may be warranted:

Very Severe	Soils have one or more properties so unfavorable for a particular use that overcoming the limitations is most difficult and costly. Reclamation is extreme, requiring the soil material to be removed, replaced, or completely modified.

1/ U.S. Department of Agriculture, Soil Conservation Service, *Guide for Interpreting Engineering Uses of Soils*, November 1971.

2/ Definitions of soil limitations developed for use by soil scientists in interpreting the limitations of soils.

APPENDIX A: SOIL LIMITATIONS
ACE BASIN

Map Symbol	Soil Association Name and Approximate Percent of Dominant Soil Series	%	Dominant Landscape Position	Drainage	Surface Texture	Subsoil Texture	Suitability 1/ Crop	Past-ure	For-est	Predominant Factor Limiting Land Use	Degree of Limitations for Soil: Roads and Streets	Septic Tank Systems	Dwellings	Recreational Areas
1	Faceville-Fuquay-Dothan													
	Faceville	30	Ridgetops	Well	Fine Sand Loam Very Friable: soft	Sandy Clay	G	G	F	Slope	Moderate	Slight	Slight	Slight
	Fuquay	20	Ridgetops and Slopes	Well	Sand: Single-Grained: Loose	Sandy Clay Loam	G	G	F	Surface Soil Texture	Slight	Moderate	Slight	Moderate
	Dothan	10	Ridgetops	Well	Sandy Loam: Very Friable	Sandy Clay Loam	G	G	G	Slope	0-8 Slight	Moderate	Slight	0-8 Slight
2	Lakeland-Blaney													
	Lakeland	45	Low Ridgetops	Excessive	Sand: Singular Grained	Sand	P	F	F	Sandy-Slope	0-8 Slight 8-15 Moderate	0-8 Slight 8-15 Moderate	0-8 Slight 8-15 Moderate	Severe
	Blaney	20	Ridgetops and Slopes	Well	Sand: Very Friable	Sandy Clay Loam	P	F	F	Surface Soil Texture	Moderate	Severe	Moderate	Moderate
3	Johnston	75	Flood Plain	Poor	Sand: Singular Grained	Sandy Loam	P	P	G	Very Poorly Drained-Frequent Flooding	Severe	Severe	Severe	Severe
4	Dothan-Orangeburg-Blanton													
	Dothan	45	See Dothan Under No. 1											
	Orangeburg	15	Ridgetops	Well	Loamy Sand: Very Friable	Sandy Clay Loam	G	G	G	Slope	0-8 Slight 8-15 Moderate	0-8 Slight 8-15 Moderate	0-8 Slight 8-15 Moderate	0-8 Slight 8-15 Moderate
	Blanton	20	Lower Slopes	Well	Fine Sand:	Sandy Clay Loam	P	F	F	Too Sandy	Slight	Slight	Slight	Moderate
5	Blanton-Vaucluse													
	Blanton	50	See Blanton Under No. 4											
	Vaucluse	20	Upper Slopes	Well	Loamy Sand: Very Friable	Sandy Clay Loam	P	F	F	Slope	2-8 Slight 2-15 Moderate 15-25 Severe	Severe	2-8 Slight 8-15 Moderate 15-25 Severe	2-15 Moderate 15-25 Severe
6	Dothan-Blanton-Vaucluse													
	Dothan	40	See Dothan Under No. 1											
	Blanton	15	See Blanton Under No. 4											
	Vaucluse	10	See Vaucluse Under No. 5											
7	Lakeland-Dothan-Vaucluse													
	Lakeland	20	See Lakeland Under No. 2											
	Dothan	20	See Dothan Under No. 1											
	Vaucluse	15	See Vaucluse Under No. 5											
8	Greenville-Faceville-Orangeburg													
	Greenville	30	Ridgetops	Well	Fine Sandy Loam: Friable	Sandy Clay	G	G	F	Shrink-Swell Potential	Moderate	0-5 Slight 5-10 Moderate	0-8 Moderate	0-8 Slight
	Faceville	30	See Faceville Under No. 1											
	Orangeburg	20	See Orangeburg Under No. 4											
9	Blanton-Fuquay-Lakeland													
	Blanton	30	See Blanton Under No. 4											
	Fuquay	25	See Fuquay Under No. 1											
	Lakeland	20	See Lakeland Under No. 2											
10	Varina-Fuquay-Dothan													
	Varina	25	Ridgetops	Well	Sandy Loam: Very Friable	Sandy Clay	G	G	F	Slope	0-8 Slight	Moderate	0-8 Slight	0-8 Slight
	Fuquay	20	See Fuquay Under No. 1											
	Dothan	10	See Dothan Under No. 1											
11	Varina-Faceville													
	Varina	35	See Varina Under No. 10											
	Faceville	20	See Faceville Under No. 1											
12	Dothan-Varina-Faceville													
	Dothan	40	See Dothan Under No. 1											
	Varina	10	See Varina Under No. 10											
	Faceville	10	See Faceville Under No. 1											
13	Clarendon-Lynchburg-Pembert													
	Clarendon	30	Flats	Moderately Well	Loamy Sand Very Friable	Sandy Clay Loam	G	G	G	Seasonal High Water Table	Moderate	Severe	Moderate	Slight
	Lynchburg	30	Low Flats	Poor	Fine Sandy Loam Very Friable	Sandy Clay Loam	G	G	G	Flooding-Wetness	Severe	Severe	Severe	Severe
	Pembert	10	Bay	Poor	Clay Loam: Friable	Clay	G	G	G	Wetness-Flooding	Severe	Severe	Severe	Severe

Map Symbol	Soil Association Name and Approximate Percent of Dominant Soil Series	%	Dominant Landscape Position	Drainage	Surface Texture	Subsoil Texture	Suitability 1/ Crop	Past-ure	For-est	Predominant Factor Limiting Land Use	Degree of Limitations for Soil: Roads and Streets	Septic Tank Systems	Dwellings	Recreational Areas
14	Fuquay-Blanton-Dothan													
	Fuquay	40	See Fuquay Under No. 1											
	Blanton	25	See Blanton Under No. 4											
	Dothan	15	See Dothan Under No. 1											
15	Dothan-Clarendon-Rains													
	Dothan	25	See Dothan Under No. 1											
	Clarendon	15	See Clarendon Under No. 13											
	Rains	15	Low Flats	Poor	Sandy Loam: Very Friable	Sandy Clay Loam	G	G	G	Wetness-Ponding	Severe	Severe	Severe	Severe
16	Portsmouth-Lakeland													
	Portsmouth	45	Low Flats & Depressions	Very Poor	Loam: Very Friable	Sandy Clay Loam	G	G	G		Severe	Severe	Severe	Severe
	Lakeland	25	See Lakeland Under No. 2											
17	Varina-Clarendon-Rembert													
	Varina	35	See Varina Under No. 10											
	Clarendon	25	See Clarendon Under No. 13											
	Rembert	20	See Rembert Under No. 13											
18	Rains-Dothan-Ocilla													
	Rains	35	See Rains Under No. 15											
	Dothan	25	See Dothan Under No. 1											
	Ocilla	10	Low Flats	Poor	Loamy Sand: Very Friable	Sandy Clay Loam	G	G	F	High Water Table	Moderate	Severe	Moderate	Moderate
19	Chipley-Cainhoy-Blanton													
	Chipley	35	Low Flats	Moderately Well	Sand: Loose Single Grain	Sand	P	F	G	Water Table	Moderate	Moderate	Moderate	Moderate
	Cainhoy	20	Low Ridgetops	Excessive	Fine Sand: Single Grained	Sand	P	F	F	Slope-Seepage	0-8 Slight 8-10 Moderate	0-8 Slight 8-10 Moderate	0-8 Slight 8-10 Moderate	Severe
	Blanton	15	See Blanton Under No. [illegible]											
20	Lynchburg-Goldboro-Rains													
	Lynchburg	30	See Lynchburg Under No. 13											
	Goldsboro	25	Flats	Moderately Well	Loamy Sand: Very Friable	Sandy Clay Loam	G	G	G	Seasonal High Water Tables	Moderate	Severe	Moderate	Slight
	Rains	20	See Rains Under No. 15											
21	Osier-Pickney													
	Osier	40	Flood Plain	Poor	Loamy Fine Sand: Very Friable	Sand	P	P	F	High Water Table	Severe	Severe	Severe	Severe
	Pickney	30	Low Flats & Depressions	Very Poor	Loamy Fine Sand: Very Friable	Sand	P	F	G	Floods-Wetness	Severe	Severe	Severe	Severe
22	Argent-Bladen-Wahee													
	Argent	30	Low Flats	Poor	Clay Loam	Clay	G	G	G	Floods-Wetness	Severe	Severe	Severe	Severe
	Bladen	25	Low Flats	Poor	Fine Sandy Loam Very Friable	Clay	G	G	G	Floods	Severe	Severe	Severe	Severe
	Wahee	20	Low Flats	Poor	Loam: Friable	Clay	G	G	G	Floods-Wetness	Severe	Severe	Severe	Severe
23	Fripp-Baratari													
	Fripp	60	Coastal Dunes	Excessive	Fine Sand: Single-Grained	Sand	P	P	F	Floods	2-15 Moderate	Slight	Severe	Severe
	Baratari	40	Low Flats	Poor	Sand: Singular Grained: Loose	Sand	F	F	F	Floods-Wetness	Severe	Severe	Severe	Severe
24	Bethera-Johns													
	Bethera	50	Low Flats	Poor	Loam: Friable	Sandy Clay	G	G	G	Wetness	Severe	Severe	Severe	Severe
	Johns	25	Flats	Poor to Moderate	Loamy Sand: Very Friable	Sandy Clay Loam	G	G	G	Wetness-Floods	Severe	Severe	Severe	Moderate
25	Cainhoy-Pickney													
	Cainhoy	60	See Cainhoy Under No. 19											
	Pickney	30	See Pickney Under No. 21											
26	Meggett-Santee													
	Meggett	90	Low Flats	Poor	Sandy Loam: Very Friable	Clay	G	G	G	High Water Table-Flooding	Severe	Severe	Severe	Severe
	Santee	5	Low Flats	Very Poor	Loam: Friable	Clay	G	G	G	Floods-Wetness	Severe	Severe	Severe	Severe
27	Chipley-Echaw-Pickney													
	Chipley	30	See Chipley Under No. 19											
	Echaw	20	Low Flats	Moderately Well	Loamy Sand: Single Grained	Sand	F	F	F	Wetness	Moderate	Severe	Slight/ Moderate	Moderate
	Pickney	15	See Pickney Under No. 21											

APPENDIX A: SOIL LIMITATIONS
ACE BASIN

Map Symbol	Soil Association Name and Approximate Percent of Dominant Soil Series	%	Dominant Landscape Position	Drainage	Surface Texture	Subsoil Texture	Suitability 1/ Crop	Pasture	Forest	Predominant Factor Limiting Land Use	Degree of Limitations for Soil: Roads and Streets	Septic Tank Systems	Dwellings	Recreational Areas
[illegible]	Rains-Pantego													
	Rains	[illegible]	See Rains Under No. 15											
	Pantego	30	Low Flats & Depressions	Very Poor	Loam: Very Friable	Sandy Clay Loam	G	G	G	Wetness	Severe	Severe	Severe	Severe
[illegible]	Byars-Coxville													
	Byars	45	Low Flats & Depressions	Very Poor	Loam: Friable	Clay	G	G	G	Wetness-Flooding	Severe	Severe	Severe	Severe
	Coxville	40	Low Flats & Depressions	Poor	Fine Sandy Loam: Very Friable	Sandy Clay Loam	G	G	G	Wetness	Severe	Severe	Severe	Severe
[illegible]	Wahee-Duplin-Dunbar													
	Wahee	25	See Wahee Under No. 22											
	Duplin	20	Lower Slopes & Flats	Moderately Well	Sandy Loam: Friable	Sandy Clay	G	G	G	High Water Table	Moderate to Severe	Severe	Moderate	Slight to Moderate
	Dunbar	10	Low Flats	Poor	Sandy Loam: Very Friable	Sandy Clay	G	[illegible]	G	Wetness	Moderate	Severe	Severe	Moderate
31	Lynn Haven-Leon													
	Lynn Haven	45	Low Flats	Poor	Fine Sand: Friable	Sand	F	F	F	High Water Table	Severe	Severe	Severe	Severe
	Leon (Barataria)	40	Low Flats	Poor	Sand: Singular Grain: Loose	Sand	F	F	F	High Water Table	Severe	Severe	Severe	Severe
32	Yonges-Hockley-Edisto													
	Yonges	30	Low Flats	Poor	Loamy Fine Sand: Very Friable	Sandy Clay Loam	G	G	[illegible]	Wetness-Floods	Severe	Severe	Severe	Severe
	Hockley	20	Low Flats	Moderately Well	Fine Sandy Loam: Very Friable	Sandy Clay Loam	F	[illegible]	[illegible]	Low Strength Wet	Moderate	Severe	Moderate	Slight
	Edisto	15	Low Flats	Poor	Loamy Fine Sand: Very Friable	Sandy Loam	G	G	G	Wetness-Flooding	Severe	Severe	Severe	Severe
33	Kiawah-Seabrook-Dawhoo													
	Kiawah	50	Low Flats	Poor	Loamy Fine Sand: Very Friable	Loamy Fine Sand	G	G	F	Flooding-Wetness	Moderate	Severe	Severe	Severe
	Seabrook	20	Low Flats	Moderately Well	Loamy Fine Sand: Very Friable	Sand	G	G	[illegible]	Wetness	Moderate	Severe	Moderate	Moderate
	Dawhoo	15	Low Flats & Depressions	Very Poor	Loamy Fine Sand: Very Friable	Sand	F	F	G	Wetness	Severe	Severe	Severe	Severe
34	Capers-Bohicket-Handsboro													
	Capers	60	Tidal Marsh	Very Poor	Clay Loam: Very Sticky	Clay	P	P	P	High Water Table	Severe	Severe	Severe	Severe
	Bohicket	30	Tidal Marsh	Very Poor	Silty Clay Loam	Silty Clay	P	P	P	Wetness-Low Strength	Severe	Severe	Severe	Severe
	Handsboro	10	Tidal Marsh	Very Poor	Mucky Silt Loam	Loam	P	P	P	Floods	Severe	Severe	Severe	Severe
35	Argent-Okeetee													
	Argent	50	See Argent Under No. 22											
	Okeetee	30	Low Flats	Poor	Fine Loamy Sand: Very Friable	Clay	G	[illegible]	G	Wetness	Severe	Severe	Severe	Moderate
36	Williman-Coosaw-Murad													
	Williman	40	Low Flats	Poor	Loamy Fine Sand: Very Friable	Sandy Clay Loam	G	G	G	Wetness	Severe	Severe	Severe	Severe
	Coosaw	20	Low Ridges	Moderately Poor	Loamy Fine Sand: Very Friable	Sandy Clay Loam	G	[illegible]	F	Wetness	Moderate	Severe	Moderate	Moderate
	Murad	15	Low Ridges	Moderately Well	Loamy Fine Sand: Very Friable	Sandy Clay Loam	F	G	F	Wetness	Moderate	Severe	Moderate	Moderate
37	Seabrook-Barataria-Wando													
	Seabrook	30	See Seabrook Under No. 33											
	Barataria	20	See Barataria Under No. 23											
	Wando	10	Low Ridgetops	Excessive	Loamy Fine Sand: Very Friable	Sand	P	G	F	Soil Texture	Slight	Slight	Slight	Moderate

1/ Ratings are based on drained conditions.
G - Good
F - Fair
P - Poor

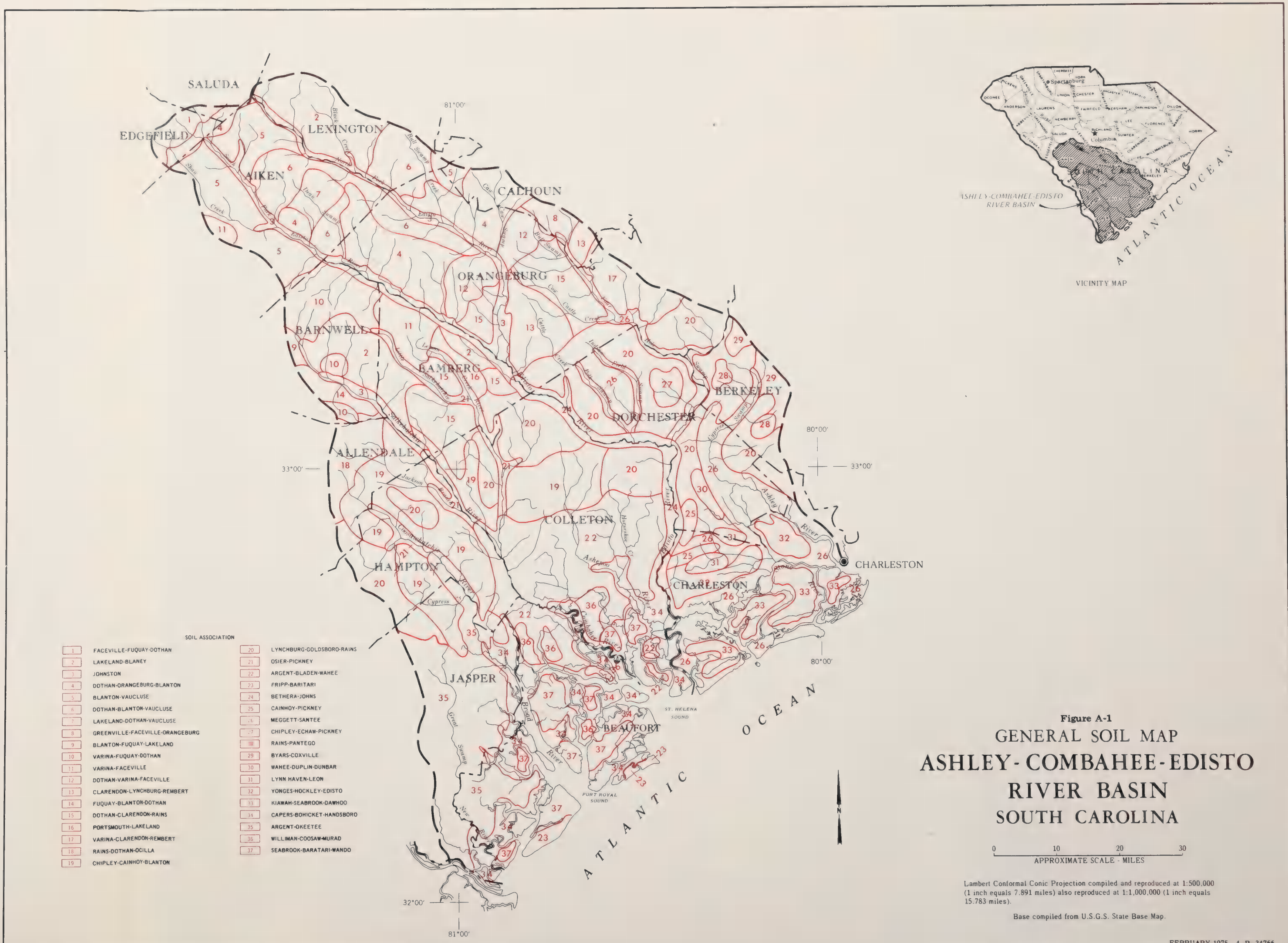

Figure A-1

GENERAL SOIL MAP

ASHLEY-COMBAHEE-EDISTO RIVER BASIN

SOUTH CAROLINA

Lambert Conformal Conic Projection compiled and reproduced at 1:500,000 (1 inch equals 7.891 miles) also reproduced at 1:1,000,000 (1 inch equals 15.783 miles).

Base compiled from U.S.G.S. State Base Map.

FEBRUARY 1975 4-R-34766

REVISED JANUARY 1975 4-R-26,010-A

USDA-SCS-FORT WORTH, TEX. 1976

APPENDIX B: INVENTORY OF POTENTIAL LARGE IMPOUNDMENTS

ACE BASIN

County	No.	Stream Location	Drainage Area (sq.mi.)	Surface Area (acres)	Storage (ac./ft.)
Aiken	1	Chinquapin Creek	24	110	1,200
	2	McTier Creek	36	540	5,800
	3	Shaw Creek	52	390	7,200
	4	South Fork Edisto River	37	570	10,000
Bamberg	5	Ghents Branch	5	60	300
	6	Savannah Creek	7	50	250
	7	Three Mile Branch	9	150	700
Barnwell	8	Buck Creek	1	210	2,800
	9	Salkehatchie River	49	730	7,100
	10	Toby Creek	17	390	3,200
Beaufort	11	Schooner Creek	12	2,000	6,000
Berkeley	12	Cypress Swamp	85	600	2,400
Calhoun	13	Burke Creek	7	150	600
Colleton	14	Ireland Creek	35	500	2,500
Dorchester	15	Cattle Creek	64	600	2,400
	16	Halfway Gut Creek	18	1,000	4,000
	17	Polk Swamp	53	300	1,800
Edgefield	18	Beach Creek	11	170	2,100
	19	Shaw Creek	19	160	1,900
Jasper	20	Cypress Creek	85	1,000	6,200
Lexington	21	Bull Swamp Creek	35	620	7,400
	22	Carneys Creek	4	200	2,500
	23	Cedar Creek	28	140	1,600
	24	Cedar Branch	4	120	1,500
	25	Rocky Creek	4	240	2,900
Orangeburg	26	Cooper Creek	6	50	250
	27	Limestone Creek	17	200	900

NOTE: No attempt was made to identify all possible impoundment sites. This list includes only those with storage potential of 250 acre feet or greater and with minimal adverse environmental effects.

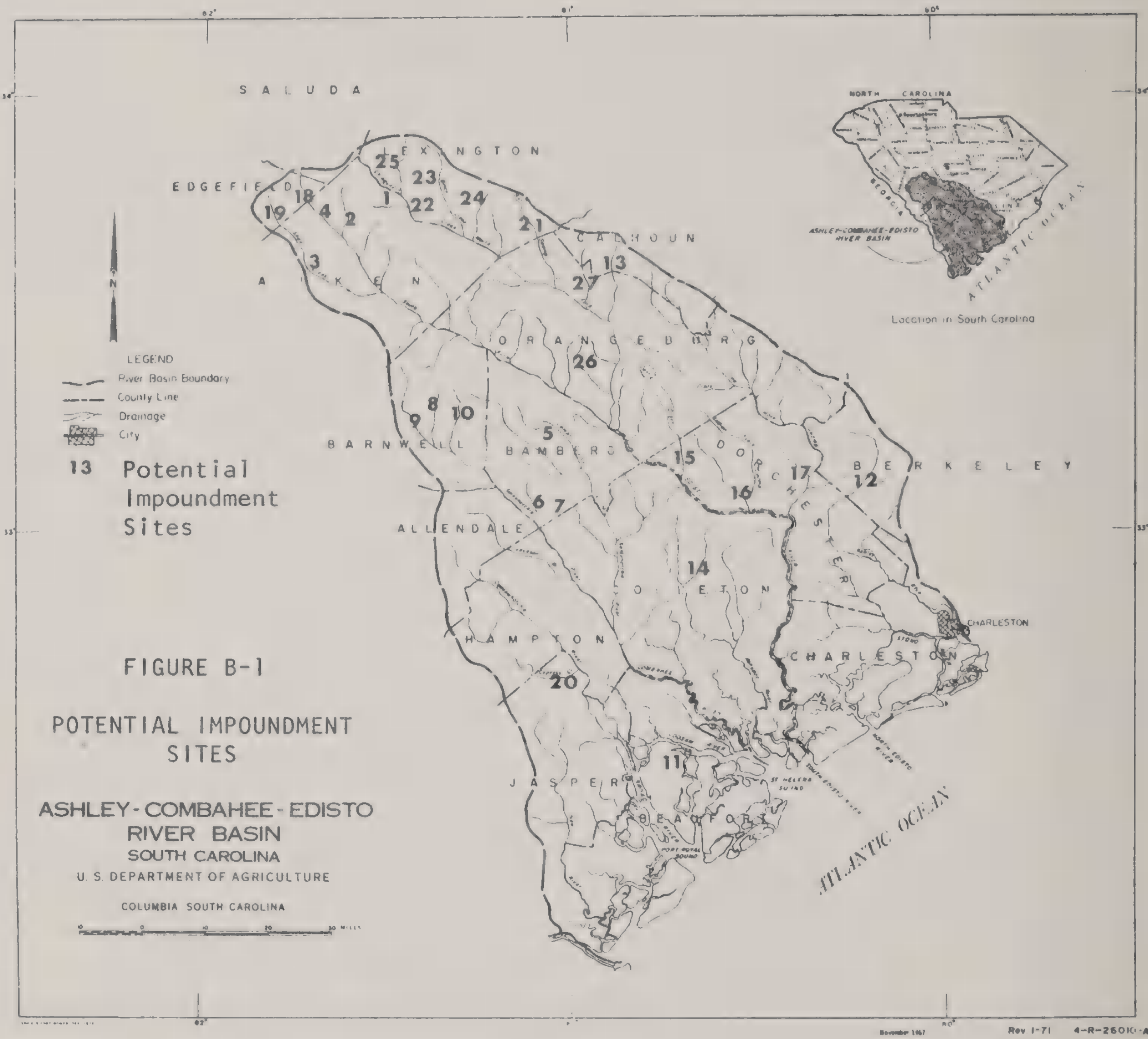

FIGURE B-1

POTENTIAL IMPOUNDMENT SITES

ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE

COLUMBIA SOUTH CAROLINA

APPENDIX C: WATER QUALITY CHARACTERISTICS AND THEIR EFFECTS

ACE BASIN

Constituent	Source or Cause	Effect
Silica (SiO_2)	Chemical decomposition of silicate minerals in the weathering process.	Causes scale in boiler and deposits on turbine blades.
Iron (Fe)	Very abundant in igneous rocks, readily precipitates as hydroxide.	Stains laundry and porcelain, bad taste.
Manganese (Mn)	Occur in sedimentary and metamorphic rocks as oxides and hydroxides frequently associated with iron minerals.	Stains laundry and porcelain, bad taste.
Calcium (Ca)	Present in most rocks and soil. Sedimentary rocks, such as limestone, gypsum and shale are a major source of calcium in natural waters.	Causes hardness, forms boiler scale, helps maintain good soil structure and permeability.
Magnesium (Mg)	Dissolved from igneous and carbonate rocks, industrial waste.	Causes hardness, high concentration of magnesium, cause bad taste and has a laxative effect.
Sodium (Na)	Dissolved from fieldspars and other common rocks, industrial wastes.	Injurious to soils and crops, and causes certain physiological conditions in man.
Potassium (K)	Abundant in many rocks and soils, but not very soluble.	Causes foaming in boilers, stimulates plankton growth.
Chromium (Cr)	Hexavalent chromium enters a water supply through certain industrial wastes.	Suspected of having carcinogenic effects.
Total Solids	Frequently used to assess the suitability of water.	Influences palatibility. Limits for industrial use and agriculture varies widely.
Turbidity	Results from suspended particles, organic and inorganic.	Important to food and beverage industry.
Alkalinity	Refers to the ability of the water to neutralize acids. Natural waters usually lower than sewage or waste water.	High alkalinity usually indicates strongly alkaline industrial waste.
pH	Ranges from 4 to 9 in most natural waters.	Major deviation from pH 7 indicates intrusion of strongly acidic or strongly basic industrial wastes.
Copper (Cu)	May occur in natural waters, waste waters, and industrial effluents as soluable copper salts or as precipitated copper compounds.	Trace: Necessary for normal body metabolism. Excess: Imparts bitter taste to water.
Zinc (Zn)	Commonly found in many natural waters. Substantial amounts can be added from deterioration of galvanized iron and industrial effluents.	Essential for normal body growth. Excess: Acts as stomach irritant and gives bitter taste to water.
Mercury (Hg)	Not commonly found in natural waters. Presence indicates pollution.	Very poisonous even in minute amounts.
Cadmium (Cd)	Usually of low content in natural water. Presence indicates industrial wastes.	Poisonous to human body. Builds up in system.
Lead (Pb)	Usually very low in public water supplies unless storage tanks have been coated with lead-base paint or lead pipes and fixtures have been used.	Accumulates in the body. Poisonous.
Bicarbonate (HCO_3)	Carbonate minerals in sedimentary rocks.	Causes foaming in boilers, and embrittlement of boiler steel. May impair suitability for irrigation.
Sulfate (SO_4)	Abundant in evaporate sediments, a component of some minerals of igneous rocks, also from oxidation of the sulfides of heavy metals.	Excess: Cathartic, taste.
Chloride (Cl)	Most rocks, soils, industrial wastes and sewage, and sea water.	Unpleasant taste, increases corrosiveness.
Fluoride (F)	Igneous rocks contain fluoride as calcium fluoride (florite) and a number of complex fluoride-bearing minerals such as apatite. Fluoride is also a component of hornblende and micas. Fluoride is only sparingly soluble in water.	High concentrations cause mottled tooth enamel in children. Low concentrations effective in preventing tooth decay.
Nitrates (No_3)	Spoil, sewage, industrial waste, decomposition of plants and animals, bacteria.	High content in water indicates pollution. Causes methemoglobinemia in infants.
Hardness	Calcium and Magnesium.	Excessive soap consumption, scale in pipes interferes in industrial processes.
Color	Substances in solution.	Little physiological significance to human or animals. Limited in drinking water. Largely for aesthetic reasons.

SOURCE: U.S. Department of the Interior, Geological Survey, T. Ray Cummings, Quality of Surface Waters of South Carolina: A Summary of Data, 1945-1968 (Open-file Report), 1969.

APPENDIX D: MAXIMUM [illegible] MINIMUM VALUE
OF DISSOLVED SUBSTANCES AND PHYSICAL
PROPERTIES OF SURFACE WATERS

ACE BASIN

(Results in milligrams per liter except as indicated. Analyses by U. S. Geological Survey.)

Period of Record	No. of Analyses	Maximum or Minimum	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids: Calculated	Dissolved Solids: Residue on evaporation at 180°C	Hardness as $CaCO_3$: Calcium Magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific Conductance (micromhos at 25°C)	pH	Color	Oxygen Consumed: Unfiltered	Oxygen Consumed: Filtered
2-1750.40 Edisto River near Jacksonboro, S. C. (Lower Station)																						
Jan. 1958-	122	Maximum	10	0.51	38	19	142	6.4	142	27	270	0.2	4.2	-	552	102	94	996	7.5	220	-	-
Oct. 1962		Minimum	1.3	.02	3.0	.3	2.7	.3	[illegible]	.8	.8	.0	.1	-	32	10	0	38	6.1	50	-	-
2-1755. Salkehatchie River near Miley, S. C.																						
Sept. 1946-	10	Maximum	12	0.29	12	1.5	6.5	1.0	[illegible]	6.6	7.0	0.1	1.2	[illegible]	70	30	[illegible]	91	7.1	100	-	-
Mar. 1965		Minimum	4.4	.00	4.6	.3	2.7	.5	14	1.3	3.8	.0	.1	29	40	14	[illegible]	40	6.2	18	-	-
2-1760.20 Combahee River at Cherokee Landing near Yemassee, S. C.																						
Oct. 1951-	34	Maximum	15	0.39	160	335	2,940	116	40	648	5,290	-	-	-	9,630	1,780	1,740	15,100	6.9	180	-	-
Aug. 1955		Minimum	1.6	.02	7.1	.2	5.1	.1	15	1.1	5.0	-	-	-	70	19	3	62	6.1	27	-	-
2-1760.40 Combahee River at Combahee Landing near Yemassee, S. C.																						
Oct. 1951-	67	Maximum	14	0.59	309	841	6,770	282	91	1,670	12,[illegible]	-	-	-	23,500	4,230	4,150	32,000	7.1	180	-	-
Aug. 1955		Minimum	.5	.02	6.8	.8	44	1.8	15	2.1	7.8	-	-	-	75	20	[illegible]	72	6.0	20	-	-
2-1765. Coosawhatchie River near Hampton, S. C.																						
Feb. 1946-	7	Maximum	10	0.46	15	1.9	6.6	1.6	53	3.7	7.5	0.2	1.7	71	100	43	3	118	6.6	140	-	-
Mar. 1965		Minimum	5.2	.05	3.7	1.0	3.8	.6	12	1.4	3.2	.0	.1	29	39	13	0	48	5.9	50	-	-
2-1725.2 Shaw Creek near Eureka, S. C.																						
Sept. 1946-	18	Maximum	8.6	0.29	2.2	1.1	4.3	1.0	9	2.6	5.4	0.2	1.5	24	34	10	2	34	7.2	40	-	-
May 1965		Minimum	4.1	.01	0.8	.2	2.9	.3	6	.1	2.7	.0	.3	18	22	4	0	26	5.7	5	-	-
2-1725. South Fork Edisto River near Montmorenci, S. C.																						
Mar. 1946-	8	Maximum	7.1	0.33	1.5	0.7	2.5	0.7	[illegible]	3.4	3.8	0.1	1.0	21	33	5	[illegible]	26	6.8	70	-	-
Dec. 1964		Minimum	2.4	.04	0.7	.1	1.8	.3	5	.4	1.5	.0	.2	13	18	4	[illegible]	20	5.8	17	-	-
2-1730. South Fork Edisto River near Denmark, S. C.																						
Mar. 1946-	64	Maximum	11	0.38	3.7	1.0	3.2	1.1	10	10	4.6	0.3	2.2	35	48	12	8	44	6.8	120	10	[illegible]
May 1966		Minimum	.8	.00	1.0	.1	1.0	.2	[illegible]	.2	1.1	.0	.1	13	15	[illegible]	0	21	5.2	13	4	3
2-1733. North Fork Edisto River near North, S. C.																						
June 1950-	18	Maximum	8.1	0.27	2.0	1.1	1.9	0.5	9	2.5	3.3	0.2	1.2	22	32	8	5	24	6.4	70	-	-
May 1965		Minimum	0.8	.04	0.6	.1	1.0	.2	[illegible]	.1	.5	.0	.0	8	16	[illegible]	0	16	5.1	7	-	-
2-1735. North Fork Edisto River River at Orangeburg, S. C.																						
Mar. 1946-	52	Maximum	8.7	0.48	3.3	1.2	2.6	1.5	17	3.1	4.3	0.2	2.2	27	43	12	5	45	6.7	120	14	11
Jan. 1965		Minimum	0.5	.01	1.0	.1	1.2	.1	4	.0	1.1	.0	.0	12	17	[illegible]	0	19	5.4	5	3	[illegible]
2-1740. Edisto River near Branchville, S. C.																						
Oct. 1949-	39	Maximum	10	0.48	3.2	1.5	3.4	1.0	11	3.7	5.7	0.3	1.6	32	54	13	6	38	6.9	140	15	10
Jan. 1965		Minimum	0.0	.05	1.7	.2	2.3	.3	6	.4	1.5	.0	.0	16	25	5	0	25	5.6	12	4	3
2-1750. Edisto River near Givhans, S. C.																						
Mar. 1946-	27	Maximum	7.3	0.40	5.9	1.2	5.8	1.6	[illegible]	7.2	6.0	0.2	1.7	[illegible]	62	18	7	55	7.2	140	-	-
Sept. 1968		Minimum	0.9	.01	2.1	.2	2.7	.2	7	.8	2.5	.0	.2	24	30	7	0	33	5.5	15	-	-
2-1750.30 Edisto River near Jacksonboro, S. C. (Upper Station)																						
Jan. 1958-	64	Maximum	9.7	0.54	6.7	2.0	4.3	1.8	20	5.8	64	0.2	5.8	-	65	46	[illegible]	259	7.0	200	-	-
Oct. 1962		Minimum	1.3	.03	2.4	.3	2.2	.2	2	.6	3.0	.0	.1	-	28	9	0	35	5.4	30	-	-

APPENDIX E: RULES APPLICABLE TO WATER CLASSES AND STANDARDS 1/

The General Assembly of South Carolina in the 1970 Pollution Control Act of South Carolina has declared the following policy:

> "It is declared to be the public policy of the State to maintain reasonable standards of purity of the water resources of the State, consistent with the public health, safety and welfare of its citizens, maximum employment, the industrial development of the State, the propagation and protection of terrestrial and marine flora and fauna, and the protection of physical property and other resources. It is further declared that to secure these purposes and the enforcement of the provisions of this act, the Pollution Control Authority shall have authority to abate, control and prevent pollution."

Consistent with this policy, the Pollution Control Authority of South Carolina (agency was merged with the Department of Health on July 1, 1973 and renamed South Carolina Department of Health and Environmental Control by South Carolina General Assembly Act No. 390) does adopt general rules for the waters of South Carolina as follows:

> "The classes and standards set forth in Section IV are intended to protect public health and welfare by providing criteria for the streams of South Carolina which will stabilize and improve water quality in step with changes in the economy of the State and new technical developments. No permit issued hereunder, therefore, shall be interpreted as creating any vested right in any person.
>
> "No waters of this State shall be used for the sole or principal purpose of transporting wastes.
>
> "No wastes amenable to treatment or control shall be discharged into any State waters without treatment or control. All biodegradable waste, prior to discharge into any State waters, shall receive a minimum of secondary treatment and all other wastes an equivalent degree of treatment, unless it can be demonstrated that a lesser degree of treatment or control will provide for water quality improvement consistent with present and anticipated future water uses.

"In any case where a body of water is tributary to another body of water which is classified in a higher class, the quality of the water in the tributary shall be maintained at a level which will not cause a contravention of the higher standards of the downstream body.

"General water quality criteria are established to maintain in the waters of the State a water quality sufficient for the survival and general well-being of fish and other aquatic life during period of migration and passage.

"In any case where streams are not otherwise classified and are tributaries to a classified stream they shall meet the quality standards of the classified stream.

"Natural waters may on occasion have characteristics outside of the limits established by the standards. The standards adopted herein relate to the condition of waters as affected by the discharge of sewage, industrial wastes or other wastes. The specified standards will not be considered violated when values outside the established limits are caused by natural conditions. Where wastes are discharged to such waters, the discharger shall not be considered a contributor to substandard conditions provided maximum treatment in compliance with permit requirements is maintained and, therefore, meeting the established limits is beyond his control."

1/ Water Classification Standards System for the State of South Carolina, South Carolina Department of Health and Environmental Control, 1974.

APPENDIX F: WATER QUALITY CLASSES AND STANDARDS

The water classification standards system for the State of South Carolina was adopted by the S.C. Department of Health and Environmental Control (formerly Pollution Control Authority) on September 8, 1971. The Environmental Protection Agency approved the standards on December 23, 1971 and January 15, 1973. Waters in the ACE Basin have been classified using the following definitions:

ESTABLISHED CLASSES FOR FRESH SURFACE WATERS AND THE STANDARDS OF QUALITY AND PURITY WHICH SHALL BE APPLIED THERETO 1/:

CLASS A

Waters suitable for use as swimming waters. Suitable also for other uses requiring waters of lesser quality.

QUALITY STANDARDS FOR CLASS A WATERS

Items	Specifications
1. Fecal coliform	Not to exceed a geometric mean of 200/100 ml; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 ml.
2. Phenolic compounds	Not greater than 1 microgram per liter, unless caused by natural conditions.
3. pH	Range between 6.0 and 8.0, except that swamp waters may range from pH 5.0 to pH 8.0.
4. Dissolved oxygen	Not less than 5 mg/l, except that swamp waters may have an average of 4 mg/l.

1/ Water Classification Standards System for the State of South Carolina, South Carolina Department of Health and Environmental Control, 1974.

CLASS B

Waters suitable for domestic supply after complete treatment in accordance with requirements of the South Carolina State Board of Health (agency was merged with the Pollution Control Authority on July 1, 1973 and renamed South Carolina Department of Health and Environmental Control by South Carolina General Assembly Act No. 390). Suitable also for propagation of fish, industrial and agricultural uses and other uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS B WATERS

Items	Specifications
1. Fecal coliform	Not to exceed a log mean of 1000/100 ml based on five consecutive samples during any 30 day period; nor to exceed 2000/100 ml in more than 20% of the samples examined during such period (not applicable during or following periods of rainfall).
2. pH	Range between 6.0 and 8.5, except that swamp waters may range from pH 5.0 to pH 8.5.
3. Dissolved oxygen	Daily average not less than 5 mg/l with a low of 4 mg/l, except that swamp waters may have an average of 4 mg/l.
4. Phenolic compounds	Not greater than 1 microgram per liter unless caused by natural conditions.

CLASSES AND STANDARDS FOR TIDAL SALT WATERS:

CLASS SA

Waters suitable for shellfishing for market purposes and any other usages. Suitable also for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS SA WATERS

Items	Specifications
1. Garbage, cinders, ashes, oils, sludge or other refuse.	None.
2. Sewage or waste effluents.	None which are not effectively disinfected.
3. Dissolved oxygen.	Not less than 5 mg/l.
4. Toxic wastes, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or shellfish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition thereof or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
5. Organisms of coliform group.	Shall meet U.S. Public Health Service Standards (1965 revision).
6. pH.	Shall not vary more than 3/10 of a pH unit above or below that of effluent free waters in the same geographical area having a similar total salinity, alkalinity and temperature.

CLASS SB

Waters suitable for bathing and any other usages except shellfishing for market purposes. Suitable also for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS SB WATERS

Items	Specifications
1. Garbage, cinders, ashes, oils, sludge or other refuse.	None.
2. Sewage or waste effluents.	None which are not effectively disinfected.
3. Dissolved oxygen.	Not less than 5 mg/l.
4. Toxic wastes, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition thereof; to make the waters unsafe or unsuitable for bathing or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
5. Fecal coliform.	Not to exceed a geometric mean of 200/100 ml; nor shall more than 10% of the samples in any 30 day period exceed 400/100 ml.
6. pH.	Shall not vary more than one-half of a pH unit above or below that of effluent-free waters in the same geographical area having a similar total salinity, alkalinity and temperature, but not lower than 6.75 or above 8.5.

CLASS SC

Waters suitable for crabbing, commercial fishing and any other usages except bathing or other shellfishing for market purposes. Suitable also for uses requiring water of lesser quality.

QUALITY STANDARDS FOR CLASS SC WATERS

Items	Specifications
1. Fecal coliform.	Not to exceed a log mean of 1000/100 ml based on five consecutive samples during any 30 day period; nor exceed 2000/100 ml in more than 20% of the samples examined during such period (not applicable during or immediately following period of rainfall).
2. Garbage, cinders, ashes, oils, sludge or other refuse.	None.
3. Dissolved oxygen.	Not less than 4 mg/l.
4. Toxic wastes, oils, deleterious substances, colored or other wastes.	None alone or in combination with other substances or wastes in sufficient amounts as to be injurious to edible fish or the culture or propagation thereof, or which in any manner shall adversely affect the flavor, color, odor, or sanitary condition of fish or impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
5. pH.	Shall not vary more than one pH unit above or below that of effluent-free waters in the same geographical area having a similar total salinity, alkalinity and temperature but not lower than 6.75 or above 8.5.

SOUTH CAROLINA DRINKING WATER STANDARDS 1/

The South Carolina Department of Health and Environmental Control collects samples of water from the distribution systems of public water supplies in South Carolina, and conducts chemical analyses in accordance with the Law, Rules and Regulations for Waterworks Systems in the State of South Carolina. These analyses are designed to determine if the finished water meets standards for chemical quality as set forth in the 1962 U.S. Public Health Service Drinking Water Standards. These analyses are also used to evaluate treatment processes where such processes are employed.

Characteristic or Chemical Substance	Limit
Total Solids	Should not exceed 500 mg/l
Turbidity	Should not exceed 5 t.u.
Color	Should not exceed 15 units
Alkalinity	Should not exceed 500 mg/l
Calcium	Related to hardness
Magnesium	Related to hardness
Hardness	Should not exceed 100 mg/l
Sodium	No standard. Provided as information for medical doctors when requested.
Iron	Should not exceed 0.3 mg/l
Chloride	Should not exceed 250 mg/l
pH	Acceptable range from 6.5 to 8.5
Manganese	Should not exceed 0.05 mg/l
Copper	Should not exceed 1.0 mg/l
Zinc	Should not exceed 5.0 mg/l
Potassium	No standard. Provided as information for medical doctors when requested.
Mercury	Should not exceed 0.5 ppb
Chromium	Should not exceed 0.05 mg/l
Cadmium	Should not exceed 0.01 mg/l
Lead	Should not exceed 0.05 mg/l

1/ Law, Rules and Regulations for Waterworks Systems in the State of South Carolina, South Carolina State Board of Health, November 1970.

APPENDIX G: INVENTORY OF STREAMS AND RIVERS BY QUALITY CLASSES

The streams and/or waters of the ACE Basin are classified as follows:

CLASS A

COMBAHEE-SALKEHATCHIE RIVER: Barnwell, Bamberg, Allendale, Hampton, Colleton, and Beaufort Counties. That portion of the stream to salt water intrusion.

COOSHAWHATCHIE RIVER: Allendale, Hampton, and Jasper Counties. Headwaters to salt water intrusion.

EDISTO RIVER (Main Stem): Orangeburg, Bamberg, Dorchester, Colleton, and Charleston Counties. The entire stream to the North Edisto and South Edisto Rivers.

JACKSON BRANCH: Allendale and Hampton Counties. The entire stream tributary to Willow Swamp.

LIGHTWOOD KNOT CREEK: Lexington County. The entire stream tributary to North Fork Edisto River.

NORTH FORK EDISTO RIVER: Aiken, Lexington, Orangeburg Counties. From its headwaters to the Orangeburg discharge.

SHAW CREEK: Aiken and Edgefield Counties. The entire stream tributary to South Fork Edisto River.

SOUTH FORK EDISTO: Aiken, Bamberg, Barnwell, Orangeburg Counties. From U.S. 1 to 3/4 mile above S.C.L. Railroad.

TURKEY CREEK: Barnwell County. That portion through Fuller Park.

LITTLE SALKEHATCHIE RIVER: Colleton County. The entire stream in Colleton County tributary to Salkehatchie River.

CLASS B

ASHEPOO RIVER: Colleton County. That portion to salt water intrusion.

ASHLEY RIVER: Dorchester and Charleston Counties. That portion to salt water intrusion.

BUCK CREEK: Barnwell County. The entire stream tributary to Salkehatchie River.

COX BRANCH: Bamberg County. The entire stream tributary to Lemon Creek.

CYPRESS SWAMP: Dorchester County. The entire stream tributary to Ashley River.

DUNCAN CREEK: Lexington County. The entire stream tributary to Chinzuapin Creek.

FOUR HOLE SWAMP: Calhoun, Berkeley, Dorchester and Orangeburg Counties. The entire stream tributary to Edisto River.

FOUR MILE CREEK: Orangeburg County. The entire stream tributary to North Fork Edisto River.

GRAPEVINE BRANCH: Bamberg County. The entire stream tributary to Lemon Creek.

LEMON CREEK: The entire stream tributary to Little Salkehatchie River.

LITTLE SALKEHATCHIE RIVER: Bamberg County. The entire stream in Bamberg County.

MILL BRANCH: Orangeburg County. The entire stream tributary to North Fork Edisto River.

NORTH FORK EDISTO RIVER: Orangeburg County. From the Orangeburg discharge to Edisto River.

POLK SWAMP: Dorchester and Orangeburg Counties. The entire stream tributary to Edisto River.

ROSEMARY CREEK: Barnwell County. The entire stream tributary to Salkehatchie River.

SANDERS BRANCH: Hampton County. The entire stream tributary to Coosawhatchie River.

SAVANNAH CREEK: Bamberg and Colleton Counties. The entire stream tributary to Salkehatchie River.

SAWMILL BRANCH: Berkeley and Dorchester Counties. The entire stream to Dorchester Creek.

SOUTH FORK EDISTO RIVER: Aiken, Bamberg, Edgefield and Orangeburg Counties. That portion from its headwaters to U.S. 1 and from 3/4 mile above the S.C.L. Railroad to its junction with North Fork Edisto River.

TURKEY CREEK: Barnwell County. From Fuller Park to Salkehatchie River.

WINDY HILL CREEK: Barnwell and Bamberg Counties. The entire stream tributary to South Fork Edisto River.

<u>CLASS SA</u>

ARCHER CREEK: Beaufort County. Parris Island Bridge to Broad River.

ASHEPOO RIVER: Colleton County. From salt water intrusion to Atlantic Ocean.

BOHICKET CREEK: Charleston County. From North Edisto River to Church Creek.

BRICKYARD CREEK: Beaufort County. Entire stream to Beaufort River.

BROAD CREEK: Beaufort County. Entire stream to Calibogue Sound.

BROAD RIVER: Beaufort and Jasper Counties. Entire stream to Port Royal Sound.

CALIBOGUE SOUND: Beaufort County. Entire sound tributary to Atlantic Ocean.

CHOWAN CREEK: Beaufort County. Entire stream tributary to Beaufort River.

COASTAL WATERS: Beaufort, Charleston, Colleton, and Jasper Counties.

COLLETON RIVER: Beaufort County. The entire stream tributary to Port Royal Sound.

COMBAHEE RIVER: Colleton and Beaufort Counties. From salt water intrusion to St. Helena Sound.

COOPER RIVER: Beaufort County. The entire stream tributary to Calibogue Sound.

COOSAW RIVER: Beaufort County. The entire stream tributary to St. Helena Sound.

COOSAWHATCHIE RIVER: Jasper County. From salt water intrusion to Broad River.

FOLLY RIVER: Charleston County. Entire stream tributary to Stono River.

FRIPP INLET: Beaufort County. Entire stream tributary to Atlantic Ocean.

HARBOR RIVER: Beaufort County. Entire stream tributary to St. Helena Sound and Fripp Inlet.

INTRACOASTAL WATERWAY: Charleston County. South Edisto River to S.C.L. Railroad over Stono River.

MAY RIVER: Beaufort County. Entire stream tributary to Calibogue Sound.

NEW CHEHAW RIVER: Colleton County. The entire stream tributary to St. Helena Sound.

OLD CHEHAW RIVER: Colleton County. The entire stream tributary to Combahee River.

PORT ROYAL SOUND: Beaufort County. The entire sound tributary to Atlantic Ocean.

RAMSHORN CREEK: Beaufort County. The entire stream between New River and Cooper River.

SAINT HELENA SOUND: Beaufort and Colleton Counties. The entire sound tributary to Atlantic Ocean.

SOUTH EDISTO RIVER: Charleston and Colleton Counties. Entire stream tributary to Atlantic Ocean.

STONO RIVER: Charleston County. From Abbapoola Creek to Folly River.

TRENCHARDS INLET: Beaufort County. The entire inlet tributary to Atlantic Ocean.

WADMALAW RIVER: Charleston County. The entire stream tributary to North Edisto River.

WADMALAW SOUND: Charleston County. The entire sound tributary to Wadmalaw River.

WHALE BRANCH: Beaufort County. The entire stream between Broad River and Coosaw River.

CLASS SB

ARCHER CREEK: Beaufort County. From Port Royal to Parris Island Bridge.

BATTERY CREEK: Beaufort County. Entire stream tributary to Beaufort River.

BEAUFORT RIVER: Beaufort County. Entire stream tributary to Port Royal Sound.

JERICHO CREEK: Beaufort County. The entire stream tributary to Battery Creek.

WRIGHT RIVER: Jasper County. Entire stream tributary to Atlantic Ocean.

CLASS SC

ASHLEY RIVER: Dorchester and Charleston Counties. Salt water intrusion to Charleston Harbor.

BEES CREEK: Jasper County. The entire stream tributary to Coosawhatchie River.

BRICKYARD CREEK: Charleston County. Entire stream tributary to Ashley River.

CHARLESTON HARBOR: Charleston County. From Battery to Atlantic Ocean.

CLARK SOUND: Charleston County. Entire sound tributary to Charleston Harbor.

INTRACOASTAL WATERWAY: Charleston County. From S.C.L. Railroad over Stono River to Charleston Harbor.

SHEM CREEK: Charleston County. The entire stream tributary to Charleston Harbor.

STONO RIVER: Charleston County. From S.C.L. Railroad to Abbapoola Creek.

APPENDIX H: CHEMICAL 1/ AND PHYSICAL ANALYSES
OF SELECTED PUBLIC WATER WELLS 2/

ACE BASIN

Station	County	Date	Solids (ppm)	Turbidity (units)	Color (units)	Alkalinity	Calcium	Magnesium	Hardness	Sodium	Iron
						ppm					
719101	Edgefield	3-74	98	0.2	5	16	21	1.7	12	9	0.1 3/
141002	Saluda	3-74	142	0.8	7	46	2.4	1.1	11	25	0.3
132006	Lexington	11-73	40	0.2	5 3/	14	1.0	0.2	3	1	0.3
132010	Lexington	1-74	54	0.36	5 3/	45	1.1	0.2	4	16	0.1
106002	Barnwell	12-73	70	2.7	5 3/	57	7.9	0.4	20	7	0.2
106004	Barnwell	12-73	58	0.2	5 3/	34	7.2	0.3	19	5	0.1 3/
105002	Bamberg	1-74	160	0.5	5 3/	127	24.4	1.3	61	5	0.1
105003	Bamberg	10-73	188	0.4	15	128	43	1.0	112	5	0.2
138010	Orangeburg	3-73	36	-	-	3	1.3	1.3	8	-	0
338017	Orangeburg	1-74	46	2.4	20	12	2.7	0.4	8	19	0.3
109002	Calhoun	3-74	86	3.1	8	55	50	1.1	17	14	2.5
103003	Allendale	2-74	82	27	6	58	13	1.6	40	2	5.1
125001	Hampton	10-73	136	0.05	5 3/	15	3.4	0.5	11	47	0.2
125002	Hampton	10-73	194	0.10	5 3/	136	35	3.0	100	8	0.2
127001	Jasper	10-73	186	0.10	5 3/	148	34	5.9	109	12	0.2
727100	Jasper	6-73	-	0.05 3/	5 3/	105	10.3	7.5	57	16	0.3
107001	Beaufort	12-73	80	0.8	5	31	5.3	1.0	17	14	0.4
507001	Beaufort	8-73	312	0.1	5	112	14.1	9.8	75	48	0.1 3/
115003	Colleton	8-73	90	0.1 3/	5	67	4.4	0.5	13	22	0.1
115004	Colleton	8-73	240	0.5	7	197	2.5	1.0	10	77	0.1
715100	Colleton	9-73	320	0.1 3/	5 3/	-	2.4	1.6	13	117	0.1 3/
118001	Dorchester	5-73	120	-	-	82	3.4	0.8	12	-	0
118003	Dorchester	8-73	100	0.4	5 3/	26	7.9	1.2	25	16	0.1 3/
708105	Berkeley	10-73	508	0.25	10	388	1.5	0.1	4	170	0.1 3/
210001	Charleston	10-73	1,338	0.55	5 3/	626	4.4	4.2	28	8	0.1 3/
710100	Charleston	11-73	240	0.20	5	155	28.1	4.6	89	12	0.2

Station	Chloride (ppm)	pH	Manganese	Copper	Zinc	Potassium	Mercury ppb 3/	Chromium	Cadmium	Lead
			ppm					ppm 3/		
719101	18	6	0.06	0.1	0.5	2.7	0.5	0.05	0.03	0.05
141002	12	6.7	0.07	0.2	0.1	1.9	0.5	0.05	0.03	0.05
132006	1 3/	5.9	0.05 3/	0.5	0.2	0.1	0.5	0.05	0.01	0.15
132010	1 3/	8.9	0.05 3/	0.1 3/	0.1 3/	0.2	0.5	0.01	0.01	0.05
106002	7	7.3	0.05 3/	1.9	0.5	0.5	0.5	0.05	0.03	0.05
106004	3	6.8	0.05 3/	0.1 3/	0.2	1.1	0.5	0.05	0.03	0.05
105002	4	7.7	0.05 3/	0.1	0.1	1.2	0.5	0.01	0.01	0.05
105003	7	8.3	0.05 3/	0.1 3/	0.1 3/	2.3	0.5	0.05	0.03	0.05
138010	6	5.5	-	0.5	0	-	0	-	-	-
338017	3	7.4	0.05 3/	0.1 3/	0.4	0.7	0.5	0.01	0.01	0.05
109002	7	7.8	0.14	0.1	0.1	3.1	0.5	0.05	0.03	0.05
103003	3	7.3	0.05 3/	0.1 3/	1.6	5.3	0.5	0.05	0.03	0.05
125001	8	8.4	0.05 3/	0.1 3/	0.1 3/	4.3	0.5	0.05	0.03	0.05
125002	7	8.2	0.05	0.1 3/	0.1	3.0	0.5	0.05	0.03	0.05
127001	6	7.8	0.05 3/	0.1	0.1	2.8	0.5	0.05	0.03	0.05
727100	8	8.3	0.05 3/	0.1 3/	0.1 3/	3.7	0.5	0.05	0.03	0.05
107001	10	8.4	0.05 3/	0.1 3/	0.2	2.7	0.5	0.05	0.01	0.05
507001	72	8.2	0.05 3/	0.1	0.1 3/	4.7	0.5	0.05	0.03	0.05
115003	3	8.6	0.05 3/	0.1 3/	0.1	5.7	0.5	0.05	0.03	0.05
115004	5	7.9	0.05 3/	0.1 3/	0.1	9.6	0.5	0.05	0.03	0.05
715100	8	8.6	0.05 3/	0.1 3/	0.1	8.2	0.5	0.05	0.03	0.05
118001	2	8.8	-	0	0	-	0	-	-	-
118003	16	7.4	0.05 3/	0.1 3/	0.4	1.1	0.5	0.05	0.03	0.05
708105	31	8.6	0.05 3/	0.1 3/	0.1 3/	10.1	0.5	0.05	0.03	0.05
210001	640	8.5	0.05 3/	0.1	0.1 3/	15.9	0.5	0.05	0.03	0.05
710100	21	7.9	0.12	0.1 3/	0.1	0.3	0.5	0.05	0.01	0.05

1/ Fluoride content not analyzed.
2/ South Carolina Department of Health and Environmental Control, Bureau of Special Environmental Programs, July 2, 1975 (computer data).
3/ Less than.

APPENDIX I: TERMS USED IN WATER QUALITY EVALUATION 1/

BOD - BIOCHEMICAL OXYGEN DEMAND

BOD is a measure of the free oxygen required to oxidize readily available organic matter in liquid wastes. Its determination is based on incubation of a mixture of waste and water under aerobic conditions for a specified period of time and measurement of the oxygen consumed. An incubation period of five days is generally considered standard and the oxygen consumed is called the BOD_5 (5-day BOD) of the waste.

Until quite recently, BOD_5 has been the primary measure of the pollutional strength of domestic sewage. The degree of treatment achieved at sewage treatment plants is usually measured as the percent reduction of BOD_5.

Occasionally the long-term BOD of waste is needed. This is determined by incubating the waste and water for a 30 to 45 day period. The resulting determination is referred to as the BOD_{30} or BOD_{45}. With animal wastes and many food processing or manufacturing wastes the long-term BOD, e.g., BOD_{30}, is usually many times as great as the BOD_5.

The effect of BOD is to reduce or deplete dissolved oxygen in water of our streams and lakes.

COD - CHEMICAL OXYGEN DEMAND

COD is a measure of the oxygen required to reduce all oxidizable material in wastes. It is evaluated chemically through use of sulphuric acid and potassium dichromate to determine the quantity of oxygen required for total oxidation.

The COD of animal wastes and many food processing or manufacturing wastes is usually several times as great as their BOD_5. COD often is only slightly greater than long-term BOD.

The pollutional effect of COD is of the same nature as that of BOD--reduction of depletion of dissolved oxygen in water. Wastes with high COD also tend to add to deposits of sludge on the bottom of streams and

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1/ U.S. Department of Agriculture, Soil Conservation Service, Agricultural Waste Management Field Manual. U.S. Government Printing Office, 1975. pp. 4-1 through 4-4.

lakes. These sludges exert a continuing benthal demand on dissolved oxygen in water above the sludge.

TOTAL SOLIDS

Occasionally referred to as TS, total solids of a waste is the residue remaining when water is evaporated from the waste sample and the remaining material is dried by heating to about 103°C. These solids, when in the liquid waste, may be suspended solids (SS) or dissolved solids (DS). That portion of suspended solids which will settle to the bottom of a sample container are settleable solids. A determination of settleable solids is an indication of the amount of solids that is removable by plain sedimentation.

Raw domestic sewage usually contains less than 0.1% total solids. Digested sludge from a waste treatment plant will contain 3 to 7 percent solids. Liquid animal manure with solids content of more than 8 to 10 percent usually is difficult to pump through pipe lines and spray nozzles.

VOLATILE SOLIDS

Normally referred to as VS, volatile solids are the portion of solids driven off as gases when total solids are heated to 600°C for one hour. That portion of solids remaining is known as fixed solids. As organic matter burns, the volatile solids portion is a measure of the amount of organic matter present in the waste. While the ratio of volatile solids to total solids varies widely between different wastes they normally represent 60 to 85 percent of total solids.

The pollution effect of solids in surface waters is the unsightliness and odor of floating matter, suspended solids, oil and grease. Organic solids render wastes and receiving waters putrescible and deplete dissolved oxygen. Settleable solids form sludge banks. Pathogenic bacteria and other organisms make waters dangerous to human and other life forms.

NITROGEN (N)

All animal and human wastes contain nitrogen. Ammonia nitrogen often called free ammonia (NH_3), is the initial product in decomposition of nitrogenous organic matter. When ammonia is oxidized, nitrites (NO_2) are formed. Nitrite forms of nitrogen are readily converted to nitrates (NO_3) which is the end product of decomposition of nitrogenous matter.

Nitrates are highly stable and soluble in water. They are readily leached through the soil profile and can pollute ground water as well as surface water. Water containing excess nitrate (over 45 ppm nitrate ion) is considered unsafe for human consumption. High nitrate concentration in water can be poisonous to animals also.

Nitrates are an important source of fertility in soil and in water. Highly enriched water promotes excessive algae and plant growth and undesirable water conditions. Eutrophication is the term commonly applied to the over-enrichment of surface water.

PHOSPHORUS (P)

Phosphorus is also a major constituent of animal and human wastes. It, like nitrogen, is a basic nutrient required in the process of eutrophication. Unlike nitrogen, phosphorus in water is readily absorbed by the clay particles of soil and leaching to ground water is more easily controlled.

Water pollution by phosphorus is generally caused by direct runoff of water or wastes containing the nutrient to a stream or lake. Phosphorus also rides piggy-back with eroded soil particles carried to such bodies of water.

POTASSIUM (K)

Potassium is a nutrient necessary for plant growth and is also contained in animal and human wastes. It is not generally considered a pollutant to surface or ground water and is not a controlling nutrient in the process of eutrophication. Because of its fertilizer value, a knowledge of the potassium content of wastes applied to land is valuable.

DISSOLVED OXYGEN (DO)

Water has an ability to absorb small amounts of oxygen commonly referred to as dissolved oxygen or DO. The capacity of water to absorb oxygen depends on water temperature and, to a lesser degree, amount of other substances in the water. Turbulent water absorbs oxygen more rapidly than still or slow moving water. The amount of oxygen which pure water can absorb varies from about 14.6 mg/l at 0°C (32°F) to about 7.6 mg/l at 30°C (86°F). Salt water containing 20,000 mg/l chloride becomes saturated with 11.3 mg/l oxygen at 0°C and 6.1 mg/l oxygen at 30°C.

APPENDIX J: ESTUARINE RESOURCES 1/

What is an estuary? Strictly from a physical standpoint, it generally can be defined as that coastal zone between the open sea and land which usually serves as a mixing zone for fresh water and sea water. Pritchard (1967) 2/ developed the following definition that has become widely accepted:

> "An estuary is a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage."

This definition implies that the following requirements be met by a system in order to be designated as an estuary:

1. "semi-enclosed coastal body of water" -- The lateral boundaries or sides of an estuary are important in establishing water circulation patterns within the system. Pritchard intends for his definition to imply that an estuary is a feature of the coast and does not form the coast. This is an arbitrary decision, but the intent is to limit the size of the system so that the lateral boundaries still play an important part in affecting circulation patterns.

2. "a free connection with the open sea" -- This phrase implies that the connection between the ocean and the estuary must be sufficient to transmit tidal energy and sea salts. The free connection must be adequate to allow an exchange of water between the estuary and the ocean during all tidal stages.

3. "sea water is measurably diluted with fresh water derived from land drainage" -- This dilution of sea water is an important process in estuaries for it contributes to the density gradients which help form the circulation patterns found in estuaries. Fresh water inflow and tidal currents are primarily responsible for determining circulation patterns.

Depending upon the pattern of fresh water flow in relation to the tidal flow, estuaries can generally be classified as belonging in one of the following categories:

1. Highly Stratified (Salt Wedge) Estuary. In this type of estuary, the ratio of fresh water flow to tidal flow is relatively large and the ratio of the width of the system to its depth is fairly small. As a result, the less dense fresh water flows out over the more dense inflowing salt water creating a stratified estuary with a well-defined interface between the two layers. Slight upward mixing of the salt water into the fresh water zone, however, does occur. (See Figure J-1.)

Figure J-1
Diagramatic Sketch of a Stratified Estuary

An example of stratified estuary in South Carolina is the Charleston Harbor-Cooper River system. During average discharge conditions (approximately 15,000 to 16,000 cubic feet per second) from Lake Moultrie into the Cooper River, the upper limit of the salt water wedge (delineated by a conductivity reading of 125 micromhos/cm) is generally located in the Cooper River between Slack Back Reach and the confluence of the diked Back River with Cooper.

2. Partially Mixed Estuary. In a system which possesses a moderate fresh water inflow and a large tidal current, a partially mixed estuary can develop. In this particular kind of estuary, the well-defined transition zone or interface between the salt and fresh water zones is largely dispersed. This is due mainly to the turbulence created by the relatively large tidal flow. Not only does salt water mix with the upper fresh water zone, but fresh water

mixes downward thereby diluting the lower salt water zone. A vertical-salinity gradient, however, is still present increasing in concentration from top to bottom, and further, the salinity of both the upper and lower layers increases seaward. (See Figure J-2.)

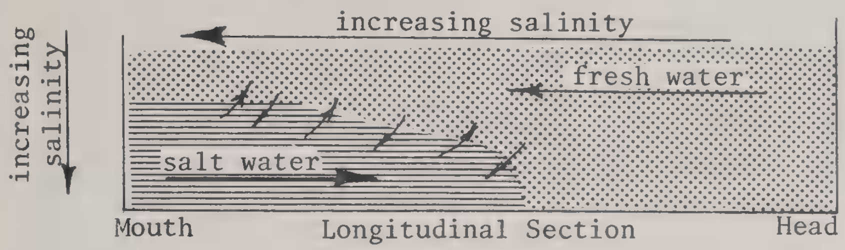

Figure J-2
Diagramatic Sketch of a Partially-Mixed Estuary

3. Homogeneous Estuary. When the ratio of fresh-water inflow is relatively insignificant in comparison with the tidal current, a vertically homogeneous system results. The tidal turbulence thoroughly mixes the fresh and salt water creating an estuary with a uniform salinity gradient increasing from the upper reaches of the estuary towards the open sea. (See Figure J-3.)

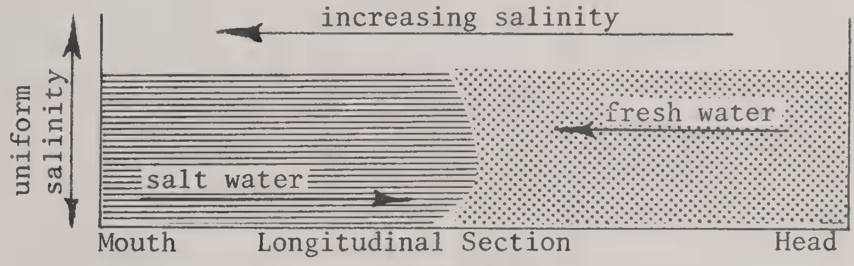

Figure J-3
Diagramatic Sketch of a Homogeneous Estuary

The Port Royal Sound estuary in South Carolina is an excellent example of a homogeneous estuary. Maximum flows at the entrance to the Sound range from 1.5 to 2.0 million cubic feet per second (cfs). The largest surface fresh water flow into the system (Cooshawhatchie River) averages less than 300 cfs. Other sources of fresh water entering the system, such as smaller rivers and ground-water seepage, have not been measured and the physical significance of their presence is not known. The mean tidal range in the Sound is approximately 7.5 feet. The combined mixing effects of these factors

contribute to the maintenance of a well-mixed system in Port Royal Sound. Salinities of 23 to 25 parts per thousand in the upper reaches of the system increase to around 30 to 35 parts per thousand (the approximate salinity of sea water) at the mouth. These values are in keeping with the expected seaward increase in salinity that occurs in a homogeneous system.

Biological Considerations

Few people consider definitions, circulation patterns, salt water wedges or salinity gradients of estuaries. However, many are aware of the opportunities to boat, swim and fish in such an area. Most people probably visualize an estuary as being a conglomeration of fish, gulls, ducks, egrets, shrimp, oysters, crabs, clams, marsh grasses, mudflats and, of course, water. Most of these considerations are biological. The mudflats contain large amounts of decaying vegetation. The water in such an area can be thought of as a biological soup--enriched with decaying organic matter and teeming with life.

Estuaries are ecosystems, and, as Kormondy (1969) 3/ points out, ecosystems are real systems comprised of the abiotic (non-living) segments of the environmental and the biotic (living) segments, such as plants, animals and microbes, in which an ecological relationship is demonstrated. A pond is an ecosystem, as is a field, a forest, or an ocean. Although ecosystems are real and identifiable, they are not isolated units. Ecosystems are invariably influenced by other systems. Ponds and lakes receive runoff from adjacent fields and forests; inhabitants of one ecosystem migrate to another; the seas are affected by the rivers discharging into them; forests encroach upon meadows and estuaries are washed by rivers and tides. Additionally, all ecosystems must depend upon some external source for energy, which is ultimately the sun.

The estuarine ecosystem represents one of nature's most productive biomes. In simple terms, productivity is merely an estimate of the number of living organisms a system supports. Specifically, primary production is an estimate of the amount and rate of autotrophic (green plant) energy fixation measured in such terms as kcal/m2/yr (kilocalories per square meter per year). Kormondy (1969) 3/ discussed the earlier work of D. F. Westlake, who in comparing the primary production of various ecosystems, revealed some interesting estimates. For example, the annual net primary productivity of a salt marsh was estimated to be roughly 12,000 kcal/m2/yr. This area was estimated to be approximately 30 times more productive than a desert, 15 times more than the ocean and a temperate zone lake, 5 times more than a polluted lake, 2½ times more than a temperate zone deciduous forest, about the same as temperate zone perennial and tropical zone annual agricultural plants, 3/5 as much as a tropical rain forest, and about 2/5 as much as tropical zone agricultural plants and a tropical zone reed swamp. The salt marsh, as demonstrated by these values, represents a highly productive environment.

In his definition of an estuarine ecosystem, Hedgpeth (1967) 4/, identified a prime reason for the productive success of estuaries:

> The estuarine ecosystem is a mixing region between sea and inland water of such shape and depth that the net resident time of suspended materials exceeds the flushing. Thus, the system constitutes . . . a nutrient trap.

Generally, such fertile waters provide the necessary ingredients to support a wide variety of life forms. The great productivity of this system is due largely, therefore, to its ability to concentrate nutrients and minerals.

According to Ketchum (1967) 5/, an estuary can be fertilized in three primary ways:

1. River waters leech plant nutrients from the soil and carry a constant supply through the estuary.

2. Pollution, either locally within the estuary, or indirectly through the river, may enrich the waters and increase productivity.

3. The subsurface counter current, which is a unique characteristic of many estuarine circulations, may enrich the estuary when the sea water is drawn from below the euphotic zone where nutrient concentrations are higher than at the surface.

The relative importance of each of these three methods by which fertilization of an estuary can occur depends primarily upon the characteristics of the particular system in question.

These nutrients, such as nitrogen and phosphorous compounds, concentrated in estuaries by the filtering action of the marsh and some of its inhabitants and probably more importantly by the tidal circulation patterns, can be considered the first phase in the cyclic movement of minerals through an estuarine food chain, or for that matter, through any type of food chain. These inorganic compounds are primarily utilized by the so-called producers in a system. These producers of autotrophs, are green chlorophyll-bearing organisms (plants) which convert radiant energy via the process of photosynthesis into chemical energy in the form of organic carbon compounds. In the estuarine ecosystem, these producers include marsh grasses, trees and algae.

Estuarine producers can be, and frequently are, consumed by other members of the estuarine ecosystem. As depicted in Figure J-4, herbivores or plant-eating animals graze upon green organisms. These animals may in turn be eaten by omnivores, animals which eat both animals and plants, or by carnivores, flesh-eating animals that occasionally feast upon an unfortunate omnivore. These three methods of obtaining nutritional requirements belong to animals which constitute that group of organisms that ingest, in part or in whole, other organisms.

These animals, along with saprotrophs and parasites are members of that larger classification of organisms known as the consumers. Consumers obtain their nutrients (organic and inorganic metabolites) and consequently, their energy from the physical and biological environment. Unlike green plants, they cannot manufacture their food from inorganic minerals and sunlight and they must depend to some extent upon other organisms, dead or alive, for these essential supplies. Herbivores, carnivores and omnivores eat other organisms; saprotrophs,

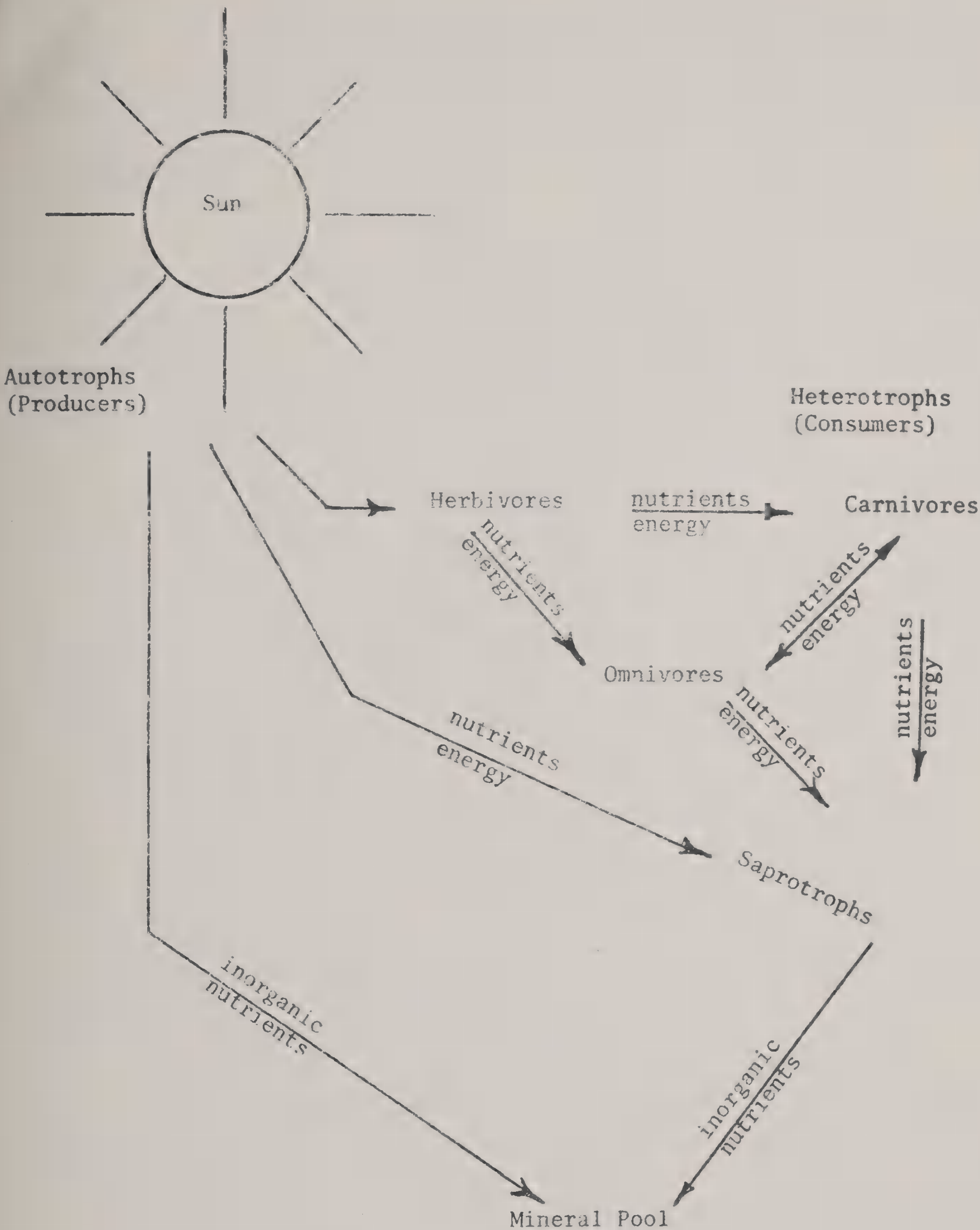

FIGURE J-4

SIMPLIFIED DIAGRAM OF ENERGY AND NUTRIENT FLOW IN AN ECOSYSTEM

primarily fungi, bacteria and protozoa, are the decomposers that live upon dead and decaying matter; and parasites derive their sustenance in or upon a living host organism.

In an estuary, the plant-eating herbivores are faced with boundless opportunities, and, as to be expected, in nature, the opportunists are many. Crustaceans and microscopic animals graze upon the algae in these coastal waters. Oysters and clams filter their food, largely phytoplankton and detritus, from the surrounding waters and from the bottoms. Small fish, insects and snails obtain their sustenance from algae and aquatic and marsh plants. The fiddler crabs rely heavily upon decaying vegetative matter as their staple food.

In addition to the herbivores, the carnivores are well represented in an estuary. As noted, these animals derive their nutritional requirements by eating other animals. In an estuary, the smaller animals that ingested the algae are probably preyed upon by small fish. These small fish may also fall victim to larger fish, or ducks, or egrets, or herons, or ospreys or other fish-eating inhabitants of the system. Likewise, many of these predators can fall victim to larger and more powerful predators--possibly alligators, bobcats, foxes or man. Other carnivores in this habitat include: otters which feast upon fish, oysters and clams; marsh hens which patrol the banks of the tidal creeks looking for crabs, shrimp, snails and small fish; and the raccoons which feed upon snails, eggs, clams, oysters, crabs and other small animals.

The omnivores of an estuary should also be recognized. This group includes those animals whose diets include both plants and animals. Several estuarine inhabitants with this type of dietary design include some of the marsh crabs which feed upon marsh grasses and which also occasionally spice up their menu with smaller crustaceans; and the shrimp, which not unlike many of the crabs, can be considered omnivorous scavengers feeding upon smaller animals, plants and decaying plant and animal matter.

One point to keep in mind in this brief look at producer-consumer relationships is that the number or amount of organisms on a given level required to support life on a higher level greatly exceeds that which it supports. This implies that, in any food web, in any ecosystem, "x" number of pounds of autotrophs can produce fewer pounds of herbivores, which in turn can support fewer pounds of carnivores. An example of this diminishing relationship in an estuarine food chain was presented in a United Nations Report (No. E/C. 7/2 Add. 7): "1,000 pounds of phytoplankton (can) produce 100 pounds of shellfish, 50 pounds of small fish, 10 pounds of small carnivores and one pound of carnivores harvested by man". 6/

A food pyramid is produced with the autotrophs forming the foundation; the herbivores, the middle section; and the carnivores, the zenith. (See Figure J-5.)

The food pyramid results from the inefficient transfer of energy through a food chain. As Kormondy (1969) 3/, revealed in his discussion of energy flow in ecosystems, of the total amount of energy fixed by producers in an ecosystem, only about 10 to 15% is utilized by herbivores. The energy fixed by the autotrophs but not utilized by the herbivores is lost to decomposers, or used in the metabolic activities of the autotrophs themselves, or just simply not utilized. Of this 10 to 15% energy value acquired by the herbivores, probably only 10 to 20%

of this value will be utilized by the carnivores. Metabolic activity, non-utilization, and decomposition are responsible again for this loss of energy along a food chain. During the period of time that green plants convert radiant energy into chemical energy in the form of organic compounds, and the plants are eaten by a small herbivore, which is in turn eaten by a small crustacean, the energy in the food chain can be depleted by as much as 99%.

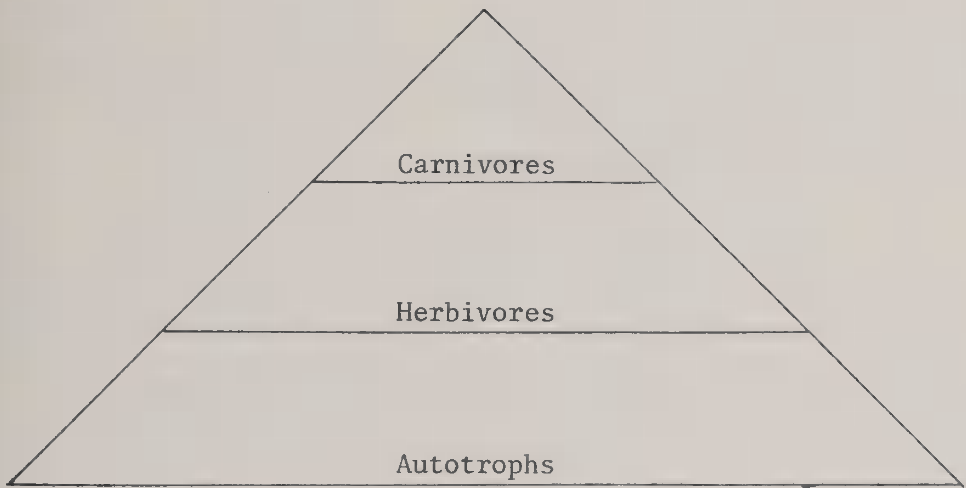

Figure J-5
Food Pyramid

Coupled with this low efficiency of energy transfer is the fact that energy flow in an ecosystem is also unidirectional. The radiant energy fixed by plants cannot be transferred back to the sun, and neither can energy acquired by herbivores and canivores be reutilized by autotrophs or herbivores, respectively.

Energy transfer in the system, is inefficient, unidirectional and noncyclic. The last step in energy transfer occurs with the decomposers. Nonliving plant and animal tissue is subject to decay or decomposition. The decomposers (bacteria, fungi and protozoa) derive their nutritional requirements and, therefore, their energy requirements from dead tissues and organic by-products. Decomposers represent the endpoint of energy flow in an ecosystem. They also represent the last step in the cyclic flow of minerals through an ecosystem. (See Figure J-4.) The end products of their processes, minerals, are once again returned to the mineral pool.

Hopefully, it has been thus far established that an estuary is a complex concoction of salinities, currents, organisms, food webs, energy patterns and more. It is a dynamic and, yet, a delicate system in which the organisms have adapted to conditions that are constantly changing. These conditions can include salinity fluctuations from almost fresh water to pure sea water in a day's time; or tidal fluctuations that twice a day can alternately flood an organism and then expose it to the drying sun; or temperature variations in excess of forty degrees in one tidal exchange period

which can result when the cool waters recede and the bright sun heats the shallow pools and exposed flats. Nature has indeed made this a versatile and dynamic environment.

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1/ South Carolina Water Resources Commission, Port Royal Sound Environmental Study, Columbia, South Carolina, 1972, pp. 7-13.

2/ Pritchard, Donald W., "What is an Estuary; Physical Viewpoint", in Estuaries, ed. by George H. Lauff, American Association for the Advancement of Science, Washington, D.C., 1967, pp. 1-5.

3/ Kormondy, Edward J., Concepts of Ecology, New Jersey, Prentice-Hall, Inc., 1969.

4/ Hedgpeth, Joel W., "The Sense of the Meeting", in Estuaries, ed. by George H. Lauff, American Association for the Advancement of Science, Washington, D.C., 1967, pp. 707-710.

5/ Ketchum, Bostwick H., "Phytoplankton Nutrients in Estuaries", in Estuaries, ed. by George H. Lauff, American Association for the Advancement of Science, Washington, D.C., 1967, pp. 329-335.

6/ United Nations Economic and Social Council, Committee on Natural Resources, Natural Resources Development and Policies Including Environmental Consideration, Addendum, Marine Pollution, 1971.

APPENDIX K: WILD AND SCENIC RIVER SYSTEMS
ACE BASIN

The staff of the South Carolina Water Resources Commission, at the request of the South Carolina Department of Parks, Recreation and Tourism, made A Reconnaissance Survey of Streams in the South Carolina Coastal Plain for Consideration as a Part of the National Wild and Scenic River System 1/. This survey was made in cooperation with and the assistance of the South Carolina Department of Parks, Recreation and Tourism, the South Carolina State Commission of Forestry, the South Carolina Wildlife and Marine Resources Department and the South Carolina Department of Health and Environmental Control.

After an assessment of the survey results, the State of South Carolina may make and submit future recommendations to the Bureau of Outdoor Recreation, U.S. Department of the Interior, which has responsibilities under the Wild and Scenic Rivers Act (Public Law 90-542). The Wild and Scenic River Act declares in part ... "certain selected rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The Wild and Scenic Rivers Act is also structured to strengthen the objectives of state and local participation by providing a means for including select state administered river areas in the national system. Once admitted to the national system, such a river receives full federal protection.

There are two basic methods for the addition of river areas to the national system: (1) federal legislation, and (2) state legislation and approval by the Secretary of the Interior.

Because rivers by nature are diverse and because they sometimes are also altered by their watershed land use, hydrologic conditions and other impacts by man, the Act establishes three classifications for possible inclusion in the system:

> Wild river areas - Those rivers or sections of rivers that are free of impoundments such as dams or other structures and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

1/ South Carolina Water Resources Commission, A Reconnaissance Survey of Streams in the South Carolina Coastal Plain for Consideration as a Part of the National Wild and Scenic River System, Columbia, South Carolina, 1971 (mimeographed).

Scenic river areas - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds that are still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas - Those rivers or sections of rivers that are readily accessible by road or railroad that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Those streams that conform closely to these criteria are as follows:

COMBAHEE RIVER SYSTEM - from the confluence of Salkehatchie and Little Salkehatchie to St. Helena Sound, a distance of about 60 miles.

EDISTO RIVER SYSTEM - North Fork Edisto River from U.S. Highway 321 to the confluence with South Fork Edisto, for a distance of 56 miles.

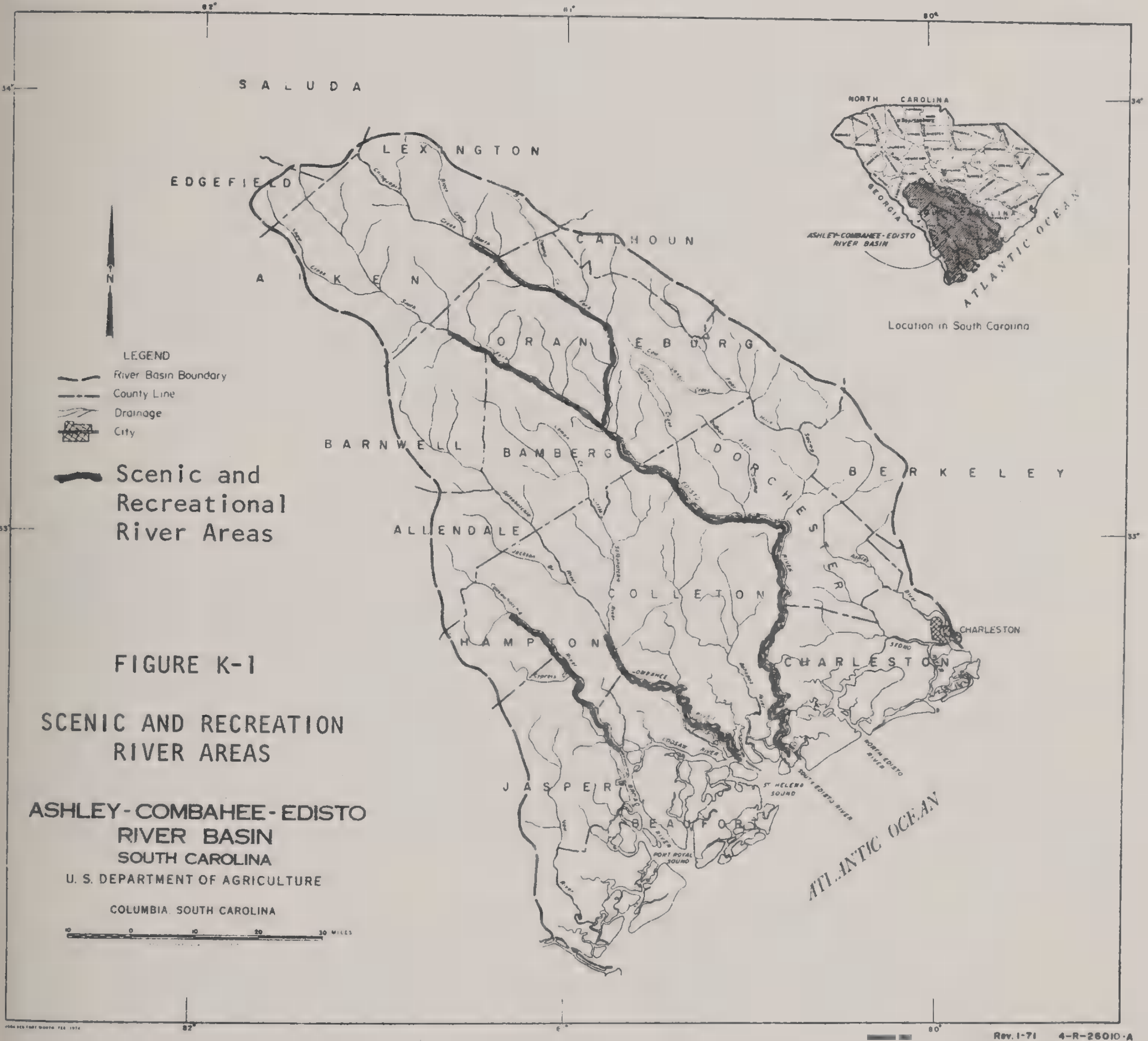
South Fork Edisto River from S.C. Highway 3 to the confluence with North Fork Edisto, for a distance of 35 miles.

Edisto River from the confluence of North and South Forks to U.S. Highway 17, for a distance of about 80 miles.

COOSAWHATCHIE RIVER SYSTEM - Beginning at S.C. Highway 363 and continuing downstream 31 miles to Secondary Road 27-206.

Figure K-1 shows the location of these streams and their relation to the total ACE Basin.

The South Carolina Water Resources Commission has the responsibility for directing the state scenic river system. Streams may be placed in the state system for protection from encroachment. Presently, no funds are available for land purchase for designating rivers in the system. Usually landowners are expected to voluntarily place their land in the system.



SALUDA
LEXINGTON
EDGEFIELD
CALHOUN
AIKEN
ORANGEBURG
BARNWELL
BAMBERG
DORCHESTER
BERKELEY
ALLENDALE
COLLETON
HAMPTON
CHARLESTON
JASPER
BEAUFORT
ATLANTIC OCEAN
ST HELENA SOUND
PORT ROYAL SOUND
NORTH EDISTO RIVER
SOUTH EDISTO RIVER
NORTH CAROLINA
GEORGIA
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
Location in South Carolina
LEGEND
River Basin Boundary
County Line
Drainage
City
Scenic and Recreational River Areas
FIGURE K-1
SCENIC AND RECREATION RIVER AREAS
ASHLEY-COMBAHEE-EDISTO RIVER BASIN
SOUTH CAROLINA
U. S. DEPARTMENT OF AGRICULTURE
COLUMBIA SOUTH CAROLINA
Rev. 1-71
4-R-26010-A

APPENDIX L: GENERAL DESCRIPTION OF STATE PARKS 1/

The South Carolina Department of Parks, Recreation and Tourism operates nine major state parks within the ACE Basin. They are classified into four categories according to size and usage as follows:

1. District park - 200 to 500 acres to serve local people in an area of 10 to 20 miles radius.

2. Regional park - 500 to 2,000 acres with wide range of activities, limited overnight accommodations, and serving one of the three recreation planning regions of the state.

3. Destination park - 2,000 to 10,000 acres with wide range of accommodations and activities for day use and entire vacations serving entire state population and non-residents.

4. Historic parks - historic sites, including those on the National Register.

Aiken State Park, a regional park, is located on the South Edisto River and contains four spring-fed lakes. Lovely winding drives weave over sandhills and through woodlands, revealing a variety of plants and birds. Nearby is Aiken's Mayfield Museum, historic Edgefield, and Columbia, the state capital. Aiken State Park has twenty-five camping units and offers boating, fishing, swimming, and nature trails.

Barnwell State Park, a district park, is an outstanding botanical area rich in flora. Two lakes, well stocked with bream and bass, offer excellent fishing. Close by are remainders of General Sherman's "March to the Sea" during the War Between the States. Barnwell State Park offers twenty-five camping units and boating, swimming and nature trails in addition to fishing.

Charles Towne Landing, a 200 acres district park, is located on the site of the first permanent settlement in South Carolina. This park features exhibits depicting South Carolina's natural and cultural history. The park's attractions include: a forest stocked with pumas, wolves, bison, and bobcats; a garden where various herbs and plants are grown along with indigo and rice; and a 17th Century trading ketch.

1/ South Carolina Department of Parks, Recreation and Tourism, South Carolina Outdoor Recreation Report, Columbia, South Carolina, 1970.

Colleton Wayside State Park, a district park near Canadys, is located adjacent to the black waters of the Edisto River. All activities here are influenced by the river. There are twenty-five camping units, and the park also offers fishing and nature trails.

Edisto Beach State Park, a regional park, is located on a semi-tropical island with more than two miles of palmetto-lined beach, sea shells, fossils, and drift wood. It is a birdwatcher's paradise. Fishing is also a popular pursuit in the park with surf, creek, and pier opportunities being enjoyed by many. Nearby are pre-revolutionary plantation homes and churches. The Edisto Beach State Park has one hundred camping units. Swimming and nature trails are additional recreational opportunities found in this park.

Givhans Ferry State Park, a regional park, is also located on the Edisto River where the dark waters teem with bass, bluegill and redbreast sunfish. This site was once the chief ferry crossing for local settlers and Indians. Givhans Ferry State Park has twenty-five camping units in addition to boating, fishing, swimming, and nature trails.

Hunting Island State Park, a destination park, is also located on a semi-tropical island. This Beaufort County park offers unexcelled beachcombing, birdwatching and surfing. An old lighthouse on the island offers a breathtaking view of this saltwater fishing and beach paradise. Hunting Island State Park, which has one hundred camping units plus another hundred being constructed, offers fishing, swimming, and nature trails. The second most popular state park in the system was Hunting Island with 899,000 visitors in 1974 2/.

Rivers Bridge State Park, a district park, is located on the Salkehatchie River near Ehrhardt in Bamberg County. This park is rich in the history of the War Between the States. A museum and earthen breastworks are reminders of a Confederate attempt to delay Sherman's march into the heart of South Carolina in 1865.

Old Dorchester State Park, an historic park, is located at the site of the town of Dorchester which was settled in 1695 by New Englanders from Massachusetts Bay. It became the third largest town in South Carolina and was the major trading village for the frontier. The town grew rapidly until about 1756 when a general exodus to Georgia took place. A fort was built on a part of the old town site in 1715 and was occupied by both American and British troops during the Revolutionary War. After the war, the town rapidly declined. Today,

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2/ Beaufort Chamber of Commerce, Beaufort, land of isles, Beaufort, South Carolina, 1974.

only the walls of the fort and a church tower remain to remind visitors of the once prosperous community. Archeological exploration is underway to expose building foundations and establish the location of streets, bridges, and wharfs.

APPENDIX M: EXISTING PROJECTS AND PROGRAMS

Federal Programs and Projects

U.S. Department of Agriculture

Soil Conservation Service: Public Law 46 authorizes the Soil Conservation Service to cooperate with local groups, as well as with other federal agencies in the development and implementation of soil and water conservation programs.

Soil and water conservation district programs are available for the entire basin. The services provided include farm planning on cropland, pastureland, forest land and other land; field services for installation of conservation practices; soil surveys; plant materials improvement; water supply forecasts; technical assistance for agricultural water management; and other such services.

Conservation practices installed with SCS assistance include stubble mulching, stripcropping, field windbreaks, chiseling and subsoiling, stock ponds, recreational area improvement, spring and well developments, fish pond management, grazing management systems, fencing, brush management, wildlife cover plantings, tree planting, woodland improved harvesting, woodland improvement, and woodland site preparation.

The Watershed Protection and Flood Prevention Act (Public Law 566, as amended) authorizes the Secretary of Agriculture to cooperate with local organizations in planning and carrying out works of improvement for flood prevention and/or the conservation, development, utilization, and disposal of water in watershed areas of less than 250,000 acres. The Act provides for technical, financial, and credit assistance by the U.S. Department of Agriculture to landowners and other local people. The small watershed program is intended to supplement other soil and water conservation projects and programs for the development and flood protection of major river basins.

Public Law 566 also enables local communities and organizations to store water for municipal, industrial, irrigation, fish and wildlife, or recreational use.

As of January 1975, there were four PL-566 watershed projects in varying stages of completion in the ACE Basin. These are grouped as follows:

Completed	- 2
Authorized for planning	- 1
Inactive	- 1

State enabling legislation provides for the creation of watershed conservation districts for the purpose of implementing the small watershed program at the local level.

Resource conservation and development (RC&D) projects are under Section 102 of the Food and Agriculture Act of 1962, Public Law 87-703, which authorizes the Secretary of Agriculture to cooperate with federal, state, territorial, and other public agencies in developing plans for a program of land conservation and land utilization, and to assist in carrying out such plans.

The Lowcountry RC&D Project is in operations in the basin. All of the counties in the Lowcountry Project area are either completely or partially within the basin. The counties involved are Beaufort, Berkeley, Charleston, Colleton, Dorchester, Hampton, and Jasper.

In addition, a small portion of the recently approved Ninety-Six RC&D Project area in Edgefield and Saluda Counties lies within the boundaries of the planning area.

Flood hazard analysis studies can be carried out by the Soil Conservation Service under its river basin authority.

Agricultural Stabilization and Conservation Service: Through its Agricultural Conservation Program, the ASCS allows landowners and operators to participate with the federal government on a voluntary basis in the installation of needed conservation practices on individual farms.

Farmers Home Administration: The Farmers Home Administration administers water development and soil conservation loans to eligible farmers and rural residents to develop water supply systems and sanitary sewer systems, and to carry out soil conservation practices.

In addition to loans to individuals, loans are also available to local organizations to help finance projects and develop land and water resources in small watersheds planned under the authority of Public Law 566. Soil and water conservation districts, watershed conservation districts, and other similar organizations which have authority under state law to carry out, operate and maintain works of improvement, are eligible for these loans.

U.S. Forest Service: The state forestry agency of South Carolina and the U.S. Forest Service work cooperatively to provide a number of services in a program of forest resource protection and management within the state. The cooperative programs are carried out based on needs determined jointly by the Forest Service and the state agency.

Services provided through these cooperative programs are as follows:

1. Assistance to private forest landowners in protection and management of their forest resources under the Cooperative Forest Management Act (CFM).

2. Assistance to sponsoring organizations in carrying out forestry practices and measures on private land within small watersheds. This service, authorized by PL-566, is provided to promote soil and water conservation on forest lands and to improve hydrologic

conditions that minimize runoff, erosion, and sediment damage.

3. Forest fire prevention and control on state and private forest lands which minimize loss of forest resources.

4. Forest insect and disease detection, evaluation, prevention, and suppression on both state and private forest lands.

5. Production and distribution of reforestation planting stock for use on state and private lands to restock idle and abandoned land.

6. Establishment and operation of tree seed orchards for production of improved forest trees.

Economic Research Service: The Economic Research Service studies the short and long-term agricultural demands for land and water resources, and evaluates the effect of alternative potentials for development of such resources on the agricultural and related sectors of the economy. The ERS and the Office of Business Economics in the Department of Commerce cooperate in a program of national and regional economic projections, and in the maintenance of an automated system to store, retrieve, and analyze economic data. This data is used to support the planning endeavors of the Water Resources Council and its member agencies.

Rural Electrification Administration: The Rural Electrification Administration makes a considerable contribution to agricultural efficiency and rural living conditions through low interest loans to rural electric cooperatives.

Cooperative Extension Service: The Extension Service is the educational branch of the U.S. Department of Agriculture. Federal, state, and county governments share in financing, planning, and carrying out information and education programs.

U.S. Department of the Army

Corps of Engineers: The Civil Works Program of the Corps of Engineers encompasses a broad range of resource development activities for navigation, flood control, major drainage, shore and beach restoration and protection, hurricane flood protection, related hydroelectric power development, water supply, water quality control, fish and wildlife conservation and enhancement, outdoor recreation, and environmental quality. In addition, the Corps is authorized to provide flood control information to states and local communities upon their request, and to aid them in providing for use and regulation of flood plain land.

The Corps of Engineers has several completed navigation and flood prevention projects in the study area. Maintenance is performed periodically on a portion of these. Maintenance operations include

removal of debris and dredging. Additional projects are now in progress or are planned for the future.

The Corps is also responsible for the maintenance of the Atlantic Intracoastal Waterway, Charleston Harbor, and the Ashley River. Current operations include contract dredging to restore original dimensions, and the removal of fallen trees and snags from the waterway.

In cooperation with the South Carolina Department of Agriculture, the Corps is presently combating water hyacinths, alligatorweed, and other aquatic plants which are choking portions of the North Fork of the Edisto River.

The Corps also cooperates in the Watershed Studies Program of the Soil Conservation Service and the Small Reclamation Project Program of the Bureau of Reclamation.

Department of Housing and Urban Development

Federal Insurance Administration: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973, were designed to share the risk of flood losses through a program of subsidized flood insurance in communities with flood plain management programs to guide new development(s). Most of the basin's flood plain communities have qualified under the emergency phase of the National Insurance Program.

Community Planning and Development: The Community Development Program provides assistance in the development of viable urban communities. This program, includes but is not limited to, providing decent housing, a suitable living environment and expanding economic opportunities principally for persons of low and moderate income.

Department of Commerce

National Oceanic and Atmospheric Administration: The NOAA was created to provide an organization which would employ a unified approach to the problems of the oceans, of the atmosphere, and of the solid earth. NOAA gathers, processes, and issues information on:

(1) weather, river and climatic conditions,
(2) coastal tides and currents,
(3) movement of ocean currents,
(4) structure and shape of ocean basins,
(5) seismic activity,
(6) precise size and shape of the earth,
(7) living resources of the global sea,
(8) economic aspects of fisheries' operations,
(9) ecological relationships between game fish and other marine and estuarine organisms,
(10) marine mining and related technology, and
(11) conditions in the upper atmosphere and space.

NOAA maintains warning systems against hurricanes, tornadoes, floods, seismic sea waves, and other environmental hazards. NOAA enhances the government's ability to provide better environmental information to vital segments of the nation's economy such as industry, communications, transportation and agriculture.

Environmental Protection Agency

The Environmental Protection Agency has been assigned responsibilities to protect and enhance man's environment. Land, air, and water resource projects are reviewed to assure that adequate consideration and evaluation has been given to the total effects of the project. The Water Quality Office develops basin-wide water pollution control programs, reviews waste treatment control of all federal installations, including water resource projects, and also reviews the applications for licenses submitted to the Federal Power Commission. It is responsible for assuring that water quality standards established on interstate streams are not violated.

Federal Power Commission

The Federal Power Commission has been assigned statutory responsibilities relative to the planning, construction, and operation of water resource projects, particularly with regard to the development of power.

U.S. Department of the Interior

Geological Survey: The Geological Survey is a technical and scientific organization which is deeply involved in defining the nation's natural resources. It collects, interprets, and disseminates information on the mineral and water resources of the nation and physical features of the country, and prepares the standard geologic and topographic map series of the country. The Survey has the responsibility for obtaining and furnishing much of the physical data needed for planning, design and operation of water resource projects.

Bureau of Outdoor Recreation: The Land and Water Conservation Fund Program, administered by BOR, remains the major source of federal financial assistance for outdoor recreation projects. Funds are administered through the State Liaison Office in the South Carolina Department of Parks, Recreation and Tourism for planning, acquisition, and development of public outdoor recreation areas and facilities.

Fish and Wildlife Service: The Fish and Wildlife Service has responsibility under the Fish and Wildlife Coordination Act to:

(1) investigate and report on water resource development projects before their construction or license by the federal government,
(2) determine the probable effects of such projects on fish and wildlife resources and associated habitats, and

(3) recommend measures for preventing or reducing damages to and improving conditions for these resources.

The Service advises and consults on environmental impacts of proposed federal and federally assisted or licensed actions in connection with Section 102 of the National Environmental Policy Act, on the establishment of water quality standards and criteria, and on the operations criteria of certain federal reservoirs and systems. The Service also diverts and impounds water in connection with its national wildlife refuge and fish-cultural programs.

State Programs and Projects

Numerous state agencies are involved with the planning and use of water and related land resources. Included are agencies involved in water resource development, outdoor recreation, pollution abatement, environmental quality, forestry, land use and development, and the general health and well-being of the population. These agencies review federal aid projects, plans, or programs which affect the control or use of water within the basin, and make appropriate recommendations.

Department of Agriculture

The South Carolina Department of Agriculture is responsible for inspecting and testing of agricultural seeds, pesticide residues and commercial feed stuffs. The Department also protects the people of the state by enforcing the Weights and Measures Law, by guaranteeing the quality of meat, produce, food and drugs, gasoline, kerosene, and fuel oils.

Agricultural Marketing Commission

The Commission aids, establishes and provides proper facilities for the efficient handling of farm and other food products in the interest of the farmer, consumer, and general public and to assist in the disposal and sale of such products.

Department of Archives and History

The South Carolina Department of Archives and History, in cooperation with the U.S. Department of the Interior and the South Carolina Department of Parks, Recreation and Tourism, is responsible for the preservation of South Carolina historic sites. The Department promotes the historic resources of the state as tourist attractions and coordinates the historical activities of state and local historical societies and agencies.

State Development Board

The purposes of the Development Board are to promote the economic development of the state and encourage industrial development, private business and commercial enterprise, agricultural production, and the use and investment of capital within the state. The development of interstate trade, commerce, and markets for South Carolina goods is also an important role of the Board.

Commission of Forestry

The Commission operates and maintains state forests for the production of timber, game management, recreation, and research areas for application of sound forestry practices. The Commission operates forest tree seedling nurseries which provide and distribute seedlings of various species throughout the state and provides information and education on conservation of privately owned forests, and gives advice and direct assistance to landowners in the proper management and use of forest lands. It provides basic forest fire prevention and control, insect and disease detection, control, prevention and suppression on state and private forest lands.

Department of Health and Environmental Control

The Department of Health and Environmental Control (DHEC) has the function of protecting the public health from the hazards of water supply, garbage and refuse disposal, wastewater disposal, recreational waters, and shellfish sanitation. It has the further function of protecting the environment or life support system from the hazards of air pollution, water pollution and land waste disposal. DHEC is responsible for the supervision and approval of Facilities Plans (Section 201, Public Law 92-500), Areawide Waste Treatment Management Plans (Section 208), and the State Water Quality Management Plan (Section 303e). The National Pollutant Discharge Eliminations System (NPDES), through which permits to discharge are issued to discharging entities is also directly administered and enforced by DHEC. The operation of an extensive network of water quality monitoring stations, as well as the maintenance of detailed records of data thus collected, is also the responsibility of DHEC.

Land Resources Conservation Commission

The South Carolina Land Resources Conservation Commission assists the state's 46 conservation districts and coordinates activities regarding the conservation, development and use of the land resources of the state. The Commission also carries out a comprehensive educational and promotional program regarding conservation of these basic resources and regulates mining reclamation activity in South Carolina.

The conservation district coordinates work of various federal, state, and local agencies within the district for the purpose of conserving basic soil and water resources.

Department of Parks, Recreation and Tourism

The South Carolina Department of Parks, Recreation and Tourism (1) promotes, publicizes, and advertises the state's tourist attractions, (2) develops and expands new and existing recreational areas, including the state park system, (3) develops a coordinated plan for using to the best advantage the natural facilities and resources of the state as a tourist attraction, and (4) preserves the state's historic areas by acquiring, marking, and publicizing areas, sites, buildings, and landmarks of historical significance.

State Ports Authority

The State Ports Authority operates and maintains two ports (Charleston and Port Royal) in the ACE Basin.

Public Service Commission

The Public Service Commission regulates privately-owned public utilities, and promotes rural electrification.

Water Resources Commission

The South Carolina Water Resources Commission is responsible for overall state water and related land resources planning and policy recommendations with consideration of water requirements and problems of all water interests. It also assists in and coordinates long-range plans for all aspects of water management and for beneficial use of the waters of the state. The Commission also conducts ground water investigations under the provisions of the 1969 Groundwater Use Act. The Commission is also responsible for coordination of the 1974 State Scenic River Act.

The agency is responsible for conducting such studies, inquiries, or analyses as may be necessary to carry out its responsibilities to the State of South Carolina.

Department of Wildlife and Marine Resources

The South Carolina Department of Wildlife and Marine Resources is conducting a Coastal Zone Management Study in the estuarine and coastal zones of South Carolina. They are studying environmental quality and inventorying the resources of the area.

The Department also establishes hunting and fishing seasons, regulates hunting and fishing, maintains game management areas, and stocks game species.

Regional Planning Councils

There are portions of five state councils of government within the basin. These are Central Midlands, Lower Savannah, Berkeley-Charleston-and Dorchester, Lowcountry and Upper Savannah. These councils conduct studies of water and related land resources and plan for future land use and water supply and quality.

APPENDIX N: HISTORICAL AND ARCHAEOLOGICAL SITES
ACE BASIN

The National Register of Historic Places is published and updated periodically by the National Park Service, U.S. Department of the Interior, pursuant to the National Historic Preservation Act of 1966 (80 Stat. 915, 16 USC 470). The following historical and archaeological sites are within the ACE Basin and are listed in the National Register of Historic Places, as of February 4, 1975.

AIKEN COUNTY

Phelps House
  Barnwell Avenue
  Aiken

BAMBERG COUNTY

River Bridge State Park
  4.2 miles west of Ehrhardt, on S.C. 64, 3 miles south on County Road 19, and 0.6 miles southeast on County Road 31
  Ehrhardt vicinity
Woodlands Plantation (William Gilmore Simms Estate)
  3 miles south of Bamberg on Highway 78 on the south bank of the south branch of the Edisto River
  Bamberg vicinity

BARNWELL COUNTY

Church of the Holy Apostles (Episcopal)
  1706 Hagood Avenue
  Barnwell
Old Presbyterian Church
  1905 Academy Street
  Barnwell
Banksia Hall
  2108 Reynolds Road
  Barnwell
The Rectory - Church of the Holy Apostles
  1700 Hagood Avenue
  Barnwell

BEAUFORT COUNTY

The Anchorage
1103 Bay Street
Beaufort
Old Barnwell-Gough House
705 Washington Street
Beaufort
William Barnwell House
King and East Streets
Beaufort
Beaufort Historic District
Approximately 304 acres comprising the old City of Beaufort, bounded by Beaufort River, south and east; Hamar and Bladen Streets, west; Boundary Street, north
Charles Forte
On the southeast side of Parris Island, on Mean's Creek
Chester Field (Shell Ring)
1 mile north of E. B. Rodgers Bridge (S.C. Route 170); 0.6 miles northeast of Broad River; 1 mile southeast of Corn Island
Laurel Bay, Port Royal Island
John A. Cuthbert House
1203 Bay Street
Beaufort
Fort Frederick
Southeastern corner of the U.S. Naval Hospital property
Port Royal
Green's Shell Enclosure
West of Hudson's Landing Road on bluff fronting Skull Creek
Hilton Head Island
Hasell Point Site
Along the edge of a bluff approximately 150 feet northeast of Hasell Landing
Beaufort vicinity
Hunting Island State Park (Lighthouse)
16 miles east of Beaufort on U.S. 21
Hunting Island
Indian Hill Site
On St. Helena Island, 0.6 miles east of Frogmore
St. Helena Island
Little Barnwell Island
On southeast side of Little Barnwell Island overlooking Whale Branch
Little Barnwell Island
Marshlands
501 Pinckney Street
Beaufort
Penn Center Historic District
One mile south of Frogmore on S.C. Highway 37
Sea Pines
1.4 miles west of Coligny Circle; 0.6 miles north-northwest of Atlantic Ocean; 2.7 miles south of Opossum Point
Hilton Head Island

Sheldon Church Ruins
4.8 miles east of Pocotaligo on U.S. 21
Gardens Corner
Skull Creek (Shell Ring)
1 mile north of S.C. Route 46; 1 mile northwest of Hilton Head School; 110 feet northwest of Hickory Bluff - Mt. Calvary Church Road
Hilton Head Island
Robert Smalls House
511 Prince Street
Beaufort
Tabby Manse (Thomas Fuller House)
1211 Bay Street
Beaufort
John Mark Verdier House (Lafayette Building)
801 Bay Street
Beaufort

CALHOUN COUNTY

Puritan Farm
U.S. 176 at its intersection with county road, 2.2 miles west of St. Matthews
Ulmer-Sumner House
Old Orangeburg Road
Cameron

CHARLESTON COUNTY

Blake Tenements
2-4 Courthouse Square
Charleston
Bleak Hall Plantation Outbuildings
On S.C. Highway 174, 0.75 miles south from Edisto Island Post Office; turn left on dirt road and continue 1.3 miles; turn left and continue 1.75 miles; turn left
Edisto Island
Branford-Horry House
59 Meeting Street
Charleston
Brick House Ruin (Edisto Island)
Route 174, at 1.8 miles south of the town of Edisto Island, turn east (left) on Brick House Avenue, 1.7 miles
Edisto Island
Citizens and Southern National Bank of South Carolina
50 Broad Street
Charleston
College of Charleston
Glebe, George, St. Philip and Green Streets
Charleston
Dock Street Theatre (Planter's Hotel)
135 Church Street
Charleston

John Drayton House (Drayton Hall)
Located on the Ashley River, 12 miles outside of Charleston
Charleston vicinity
Edisto Island Presbyterian Church
From town 1.9 miles on S.C. 174 north
Edisto Island
The Exchange and Provost
East Bay Street at the foot of Broad Street
Charleson
Fenwick Halls
9.3 miles south of Charleston on U.S. 17 South; 18 miles south of the Ashley River Bridge, south 2.5 miles on State 615, then south on 171, 4.1 miles to house
John's Island
Fig Island Site
2 miles southwest of Rockville on north bank of Ocella Creek, 1 mile southeast of Point of Pines on North Edisto River
Edisto Island
Fireproof Building
100 Meeting Street
Charleston
Fort Johnson/Power Magazine
Approximately 3 miles southeast of Charleston
James Island
William Gibbes House
64 South Battery
Charleston
Hanckel Mound
2 miles northwest of Rockville on Wadmalaw Island
Rockville, Wadmalaw Island
DuBose Heyward House
76 Church Street
Charleston
Heyward-Washington House
87 Church Street
Charleston
Horse Island
1 mile south of Rockville, 800' southeast of Bohicket Creek, 0.08 miles north-northwest of Privateer Point
Seabrook Island
Charleston's French Quarter District (Lodge Alley)
Bounded on the south by Lodge Alley, on the north by Cumberland Street, on the east by East Bay Street, on the west by State Street
Charleston
McCrady's Tavern and Long Room
153 East Bay Street
Charleston
Magnolia Gardens
S.C. Highway 61, 10 miles northwest of Charleston on the Ashley River
Charleston vicinity

Market Hall and Sheds
188 Meeting Street
Charleston
Marshlands Plantation House
On the north side of Fort Sumter Drive, about 0.10 mile before end of the street, on Fort Johnson tract
James Island
Middleton's Plantation
On S.C. 174 about 3.5 miles north, then left on an unnumbered road for about 2 miles
Edisto Island
Old Charles Town Site
Albemarle Point
Charleston
South Carolina State Arsenal (The Old Citadel)
2 Tobacco Street (Marion Square)
Charleston
Old House Plantation
North from town 1.1 miles on S.C. 174, northeast 2 miles on County Road 768, then right on unnumbered road for about 1.2 miles
Edisto Island
Peter's Point Plantation
0.10 miles south of the Edisto Island Post Office on S.C. Highway 174, turn west on County Highway 764, house at the end of the road
Edisto Island
Powder Magazine
79 Cumberland Street
Charleston
The Presbyterian Manse
North-northwest from town on S.C. 174 about 2.7 miles, left (south) on unnumbered road for about 0.9 miles
Edisto Island
Village of Rockville Historic Height
Bounded northeast by a line drawn from Bohicket Creek northwest, including the Sosnowski House; southeast by Bohicket Creek; southwest by marshlands of Breakfast Creek; northwest by a line drawn from southwest to northeast, including the Welch's Land House and intersecting S.C. Highway 700
Rockville vicinity
Thomas Rose House
57-59 Church Street
Charleston
Nathaniel Russell House
51 Meeting Street
Charleston
Edward Rutledge House
117 Broad Street, at Orange Street
Charleston
St. Andrews Parish Church
5 miles northwest of Charleston on the north side of the Ashley River
Charleston vicinity

William Seabrook House
North-northwest from town on S.C. 174, 1.9 miles; northeast on County Road 968, 1 mile; east on County Road 768 about 0.7 miles
Edisto Island
Simons-Edwards House
12-14 Legare Street
Charleston
South Carolina National Bank of Charleston
16 Broad Street
Charleston
Colonel John Stuart House
104-106 Tradd Street
Charleston
The Sword Gates House
32 Legare Street (111 Tradd Street)
Charleston
Trinity Episcopal Church
About 1.2 miles north of town of S.C. 174
Edisto Island vicinity
Hibernian Society Hall
105 Meeting Street
Charleston
Robert Barnwell Rhett House
6 Thomas Street
Charleston
Robert William Roper House
9 East Battery
Charleston
St. Philip's Church
146 Church Street
Charleston
Farmers' and Exchange Bank
14 East Bay Street
Charleston
Circular Congregational Church Parish House
150 Meeting Street
Charleston
William Blacklock House
18 Bull Street
Charleston
Joseph Manigault House
350 Meeting Street
Charleston
Old Marine Hospital
20 Franklin Street
Charleston
Unitarian Church
6 Archdale Street
Charleston
Governor John Rutledge House
116 Broad Street
Charleston

The Stono River Slave Rebellion Site
12 miles west of Charleston in the Rantowles vicinity; north side of U.S. 17 and west bank of Wallace River
Windsor Plantation
S.C. Highway 174, 6½ miles north of Edisto Island Post Office, cross Russell Creek, first unimproved road on east side arrives at house
United States Post Office and Courthouse
83 Broad Street
Charleston
McLeod Plantation
325 Country Club Drive
James Island
Charleston
Spanish Mount Point (The Mound)
Edisto Island
James Nicholson House (Ashley Hall School)
172 Rutledge Avenue
Charleston
Stiles-Hinson-Thompson House
940 Paul Revere Drive
James Island
Charleston
United States Customhouse
200 East Bay
Charleston
John Seabrook Plantation Bridge (Admiral George Palmer's Bridge)
Northwest of Rockville off S.C. 700
Wadmalaw Island
Rockville
Arnoldus Vaner Horst House
On Kiawah Island, 25 miles southwest of Charleston, approximately 1½ miles inland from the Atlantic Ocean on the banks of the Kiawah River
Johns Island
William Aiken House and Associated Railroad Structures
456 King Street (48 Elizabeth Street)
Charleston
Miles Brewton House
27 King Street
Charleston
Robert Brewton House
71 Church Street
Charleston
Fort Sumter National Monument
Charleston Harbor
Clark Mills Studio
51 Broad Street
Charleston
St. Michael's Episcopal Church
80 Meeting Street
Charleston

Willtown Bluff
Five miles west of Adams Run Community, just beyond the end of County Highway 55 on banks of South Edisto River

Castle Pinckney
On Shute's Folly Island, sandy marsh island in the Charleston Harbor, 1600 yards from the eastern waterfront
Charleston Harbor

Charleston Historic District (extended)
Two historic areas: (1) bounded by Cumberland, State, Chalmers, and Meeting Streets and (2) bounded by East Battery on the east, South Battery on the south, Logan and Lenwood Streets on the west, and by Broad Street on the north
Charleston

Bethel Methodist Church
57 Pitt Street
Charleston

Huguenot Church
136 Church Street
Charleston

COLLETON COUNTY

Colleton County Court House
Corner of Hampton and Jeffries Streets
Walterboro

Old Colleton County Jail
Jeffries Boulevard
Walterboro

Pon Pon Chapel
On Parker's Ferry Road, 1 mile from S.C. 64
Walterboro

Walterboro Library Society Building
Wichman Street
Walterboro

Tom Williams House
North Street, ¼ mile west of the town limits on S.C. Highway 362
Williams

DORCHESTER COUNTY

Indian Fields Methodist Camp Ground
From intersection of Highway 78 in St. George, northeast on U.S. Highway 15 approximately 3 miles, turn left on S.C. Highway 73 for 7.10 miles
St. George vicinity

Middleton Place
14 miles northwest of Charleston, 10 miles southeast of Summerville on S.C. Highway 61
Summerville

Old Dorchester
6 miles south of Summerville on S.C. 642
Summerville vicinity

Old Carroll Place
Intersection of the Quaker Road (County Highway 49) and the Wire Road (County Highway 19)
St. George

Newington Plantation
Located northwest of Bacons Bridge Road between Summerville town limit and Dorchester Creek

JASPER COUNTY

Gillisonville Baptist Church
On U.S. Highway 278 in the town of Gillisonville
Ridgeland vicinity

ORANGEBURG COUNTY

Eutaw Springs Battleground Park
Along Highways 6 and 45, 2 miles east of Eutawville
Eutawville vicinity

Orangeburg County Jail
44 St. John Street
Orangeburg

Southern Railway Passenger Depot
110 North Main Street
Branchville

White House United Methodist Church
10 miles north of Orangeburg on U.S. Highway 301 near Interstate Highway 26 intersection

The ACE Basin claims a number of the twenty or so shell rings located from the central coast of South Carolina to the central coast of Georgia. These are prehistoric Indian shell middens originally deposited in a ring shape. All are believed to date early in the second millenium B.C., and contain some of the earliest pottery known in North America. Some are included in the National Register of Historic Places.

Very little other information concerning archeological sites has been made public. According to Dr. Robert L. Stephenson, State Archeologist, locations of the sites must remain confidential in order to protect them from unauthorized digging by well-meaning but untrained "relic collectors". The following is a list of archeological sites and types by county as of June 1975. These sites are located in Planning Regions 5, 9,and 10 and may have more than one level of occupation.

AIKEN COUNTY (AK)

Total number of sites - 162

miscellaneous	36	mounds	3
prehistoric: misc.	42	historic: misc.	43
Paleo-Indian	1	ruins	1
archaic	22	structures	1
woodland	51	forts/trading posts	2
village	2	potteries	2
camp	1	cemeteries	1
rock shelters	1		

ALLENDALE COUNTY (AL)

Total number of sites - 83

miscellaneous	38	village	2
prehistoric: misc.	4	quarry	2
Paleo-Indian	2	mounds	2
archaic	20	shell middens	1
woodland	25	historic: misc.	2
Mississippian	2		

BAMBERG (BM)

Total number of sites - 36

miscellaneous	4	historic: misc.	2
archaic	25	structures	1
woodland	17		

BARNWELL COUNTY (BR)

Total number of sites - 23

miscellaneous	11	woodland	22
prehistoric: misc.	41	historic: misc.	13
archaic	8	structures	2

BEAUFORT COUNTY (BU)

Total number of sites - 115

miscellaneous	8	shell rings	6
prehistoric: misc.	4	historic: misc.	10
Paleo-Indian	2	ruins	6
archaic	12	structures	6
woodland	8	forts/trading posts	6
village	6	mills	1
mounds	11	cemeteries	5
shell middens	32	canoe	2

BERKELEY COUNTY (BK)

Total number of sites - 155

miscellaneous	60	ruins	2
prehistoric: misc.	34	structures	8
archaic	1	towns	3
woodland	6	waterways	1
Colono-Indian	6	ferry/fords	1
mounds	3	cemeteries	2
historic: misc.	43	underwater	5

CALHOUN COUNTY (CL)

Total number of sites - 22

miscellaneous	9	mounds	1
prehistoric: misc.	2	historic: misc.	1
Paleo-Indian	1	structures	1
archaic	5	forts/trading posts	1
woodland	5		

CHARLESTON COUNTY (CH)

Total number of sites - 180

miscellaneous	24	shell rings	10
prehistoric: misc.	6	historic: misc.	11
woodland	12	ruins	8
Mississippian	3	structures	35
village	10	towns	2
camp	1	forts/trading posts	4
mounds	2	canoe	1
shell middens	54	underwater	2

COLLETON (CN)

Total number of sites - 12

miscellaneous	1	structures	4
archaic	1	forts/trading posts	2
Colono-Indian	1	underwater	3
ruins	1		

DORCHESTER (DR)

Total number of sites - 12

miscellaneous	2	ruins	1
archaic	3	structures	2
woodland	2	towns	1
villages	2	forts/trading posts	1

HAMPTON (HA)

Total number of sites - 16

miscellaneous	4	Mississippian	1
archaic	7	village	3
woodland	5		

JASPER (JA)

Total number of sites - 34

miscellaneous	2	shell middens	2
prehistoric: misc.	2	historic: misc.	12
archaic	4	structures	2
woodland	12	cemeteries	1
mounds	3		

ORANGEBURG (OR)

Total number of sites - 42

miscellaneous	30	woodland	3
Paleo-Indian	1	historic: misc.	4
archaic	7		

The following tabulation indicates the total number of archeological and historical sites which have been inventoried:

County	Archeological Sites (total in county)	Historical Sites (total in county)	Historical Sites in National Register (hydrologic basin)
Aiken	162	56	1
Allendale	83	14	0
Bamberg	36	28	2
Barnwell	23	27	4
Beaufort	115	93	21
Berkeley	155	79	0
Calhoun	22	40	2
Charleston	180	179	73
Colleton	12	43	5
Dorchester	12	19	5
Hampton	16	13	0
Jasper	34	16	1
Orangeburg	42	29	4
TOTAL	892	636	118

APPENDIX O: STATE AGRICULTURAL MODEL
ACE BASIN

A linear programming model of South Carolina's agricultural sector was used to make projections for the ACE Basin. The state model was divided into three basins: The ACE, the Santee-Savannah and the Pee Dee (Figure O-1). The OBERS Projections, Series E' 1/ for livestock and soybean production in 1990 and 2020 deviated significantly from recent trends. Both projections were outside the 95 percent confidence interval for the linear trend line based on production levels from 1950 to 1974. Production projections for both enterprises were adjusted to an expected level more consistent with livestock and forage production practices, historical trends and capabilities of the state's resource base (Figures O-2 and O-3). All other projected levels of agricultural production used in the model correspond to OBERS level projections (Table O-1). The acreage involved in agricultural production, by enterprise, for the base year (1972) and for 1990 and 2020 is shown in Tables O-2, O-3 and O-4. These tables also indicate the expected yield levels for each crop.

Any factors which affect yields such as technological breakthroughs or availability of inputs could cause major changes in land use projections. For example, if sufficient fertilizer were not available or too costly, even more land might be needed than indicated by the model. If conditions continue as they have in the recent past, then land uses indicated by Table O-5 are the best estimates of likely agricultural land needs in the future.

By 2020, there will apparently be very little idle cropland unless yields are higher than assumed or production levels are lower. This indicates that although there is currently a large reserve of cropland not in production, it will be needed for future agricultural production.

Additional information concerning input data used in the state agricultural model is available on request from the Soil Conservation Service.

1/ 1972 OBERS Projections, Series E' Population Supplement, Agricultural Projections, Volumes 1, 3 and 4. Prepared by U.S. Department of Agriculture, Economic Research Service, Natural Resources Division for the U.S. Water Resources Council, Washington, D.C., U.S. Government Printing Office, 1975.

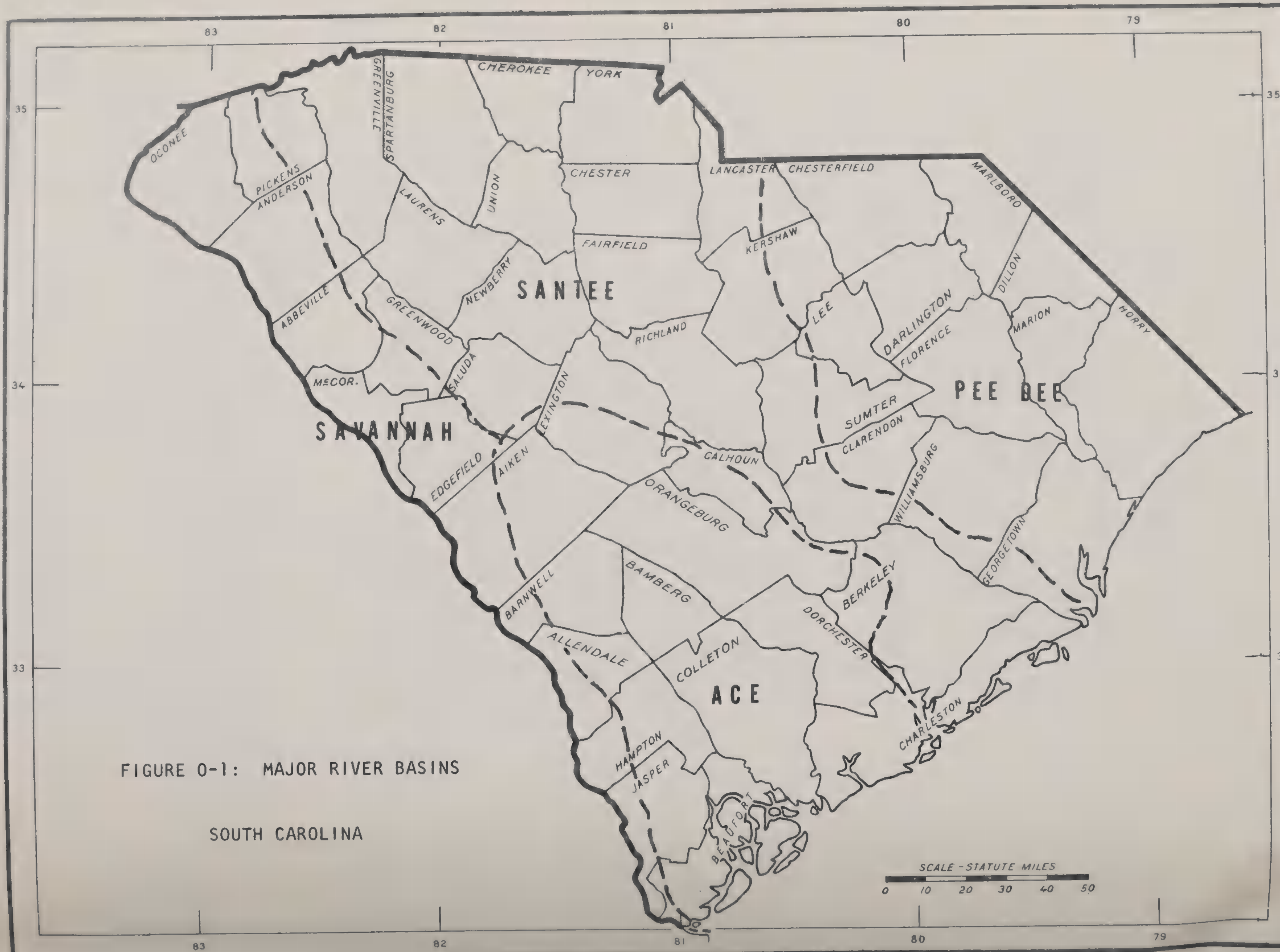

FIGURE O-1: MAJOR RIVER BASINS

SOUTH CAROLINA

FIGURE 0-2: BEEF AND VEAL PRODUCTION - HISTORIC AND PROJECTED

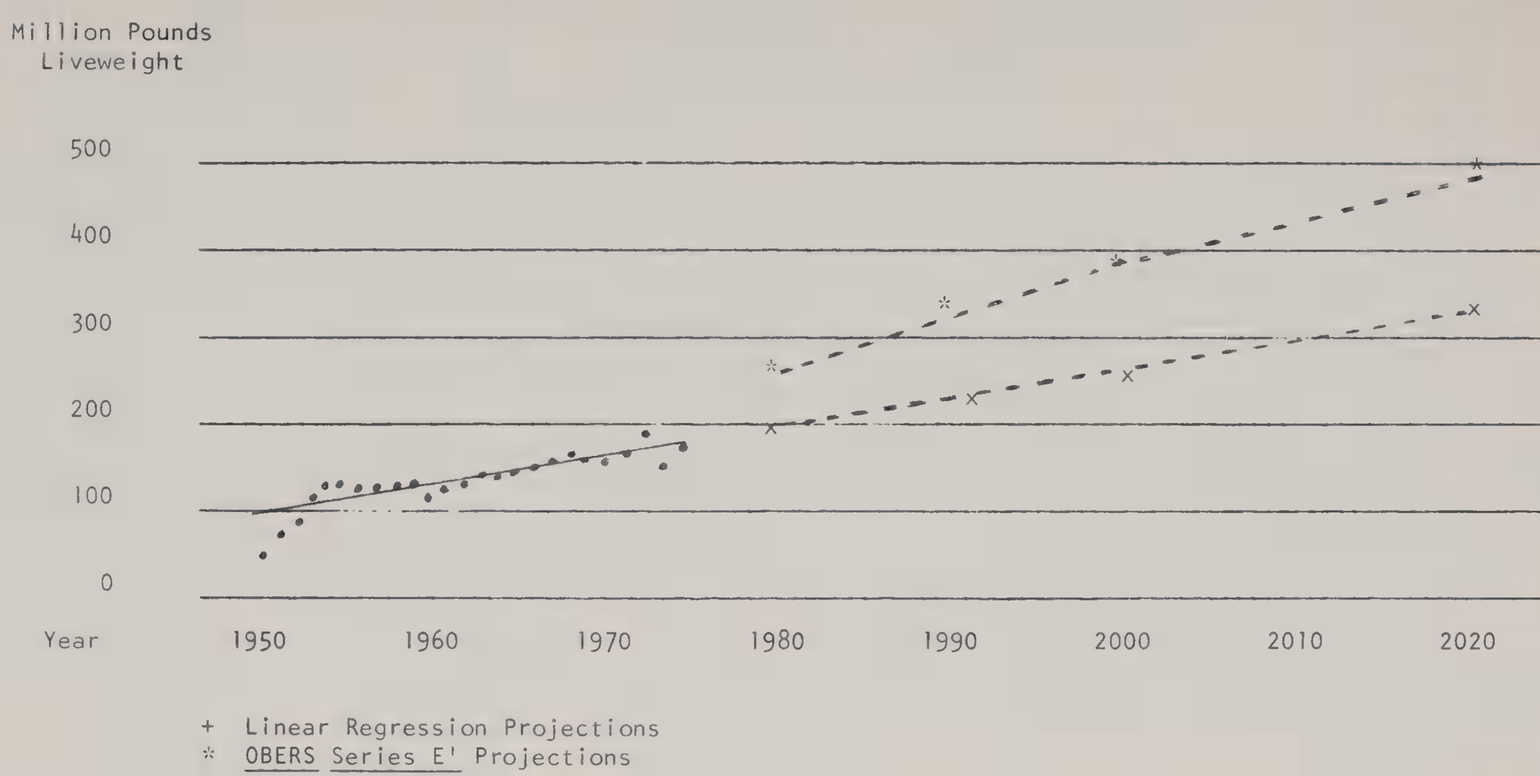

FIGURE 0-3: SOYBEAN PRODUCTION - HISTORIC AND PROJECTED

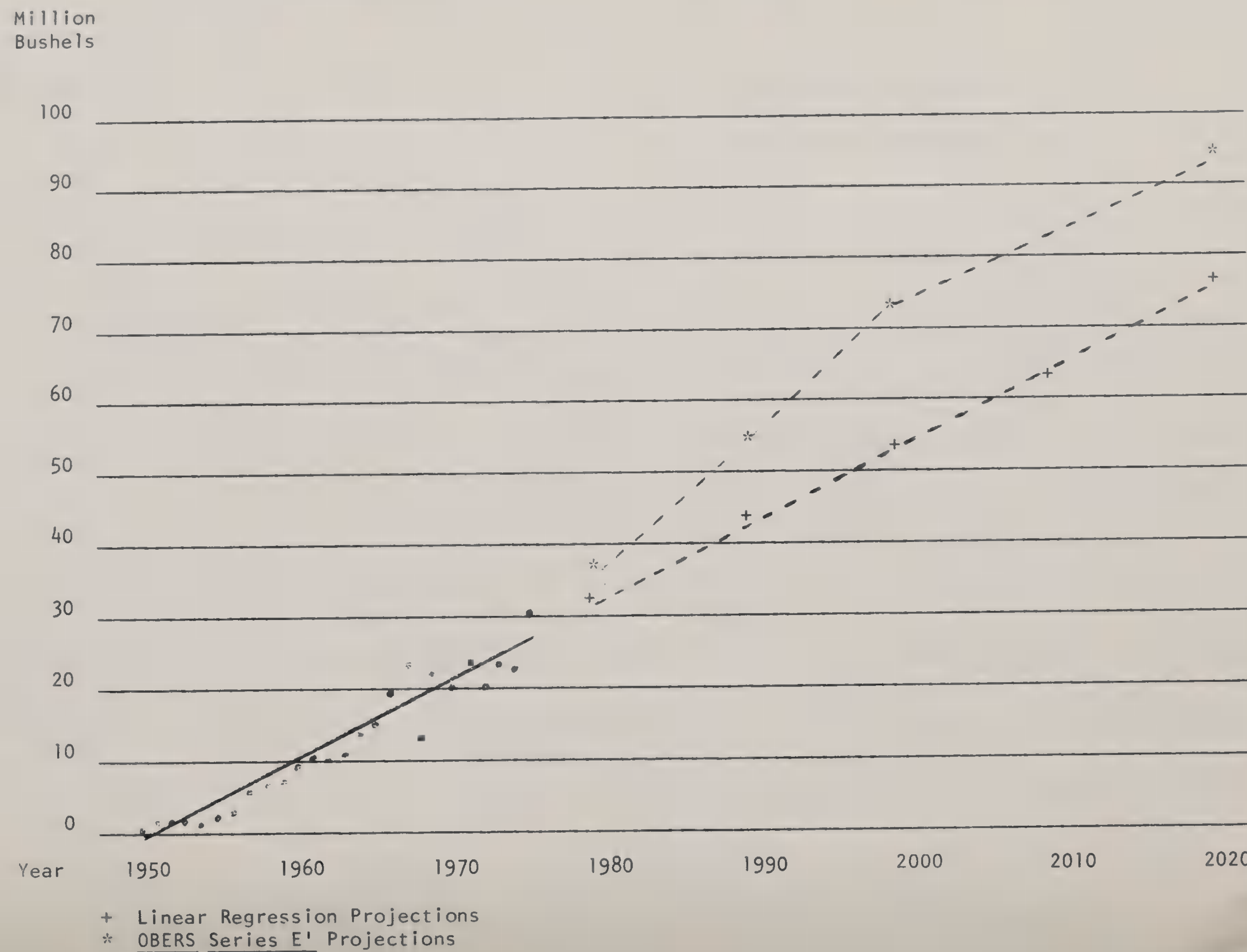

TABLE 0-1: HISTORIC AND PROJECTED CROP AND LIVESTOCK PRODUCTION

SOUTH CAROLINA

Commodity	Unit	1964	1974	1990	2020
		(Thousands)			
Crop					
Cotton	480 lb. Bales	556	274	124	46
Corn	Bushels	17,600	31,260	17,340	29,300
Wheat	Bushels	2,295	3,950	2,226	1,504
Oats	Bushels	5,421	3,234	1,500	388
Barley	Bushels	962	960	1,357	1,941
Hay	Tons	412	440	239	132
Sorghum	Bushels	150	570	117	35
Soybeans	Bushels	14,556	23,750	53,000	76,400
Tobacco	Pounds	156,240	172,000	157,700	193,900
Peanuts	Pounds	14,280	31,000	45,400	69,700
Peaches	Bushels	1,250	4,500	8,125	11,000
Tomatoes	Tons	33	28	34	24
Livestock					
Beef & Veal	Lbs.	144,400	173,600	225,400	320,400

SOURCE: Derived from OBERS Projections, Series E'.

TABLE 0-2: AGRICULTURAL PRODUCTION BY COMMODITY

SOUTH CAROLINA
1972 BASE YEAR

Crop	Production	Acreage	% of Total	Average Yield/Acre
Cotton	147,800,000 lbs.	342,315	9.4	432.0 lbs.
Corn	23,630,000 bu.	381,288	10.5	62.0 bu.
Wheat	2,720,000 bu.	139,146	3.8	19.5 bu.
Oats	2,740,000 bu.	71,683	2.0	38.2 bu.
Barley	920,000 bu.	27,926	0.8	32.9 bu.
Roughage	3,444,000 tons	1,497,450	41.2	2.3 tons
Sorghum	430,000 bu.	13,290	0.4	32.4 bu.
Soybeans	20,000,000 bu.	1,063,991	29.2	18.8 bu.
Tobacco	131,100,000 lbs.	62,316	1.7	2,104.0 lbs.
Peanuts	31,800,000 lbs.	15,425	0.4	2,062.0 lbs.
Peaches	4,575,000 bu.	16,123	0.4	283.8 bu.
Tomatoes	33,000 tons	7,804	0.2	4.3 tons
STATE TOTAL		3,638,757	100.0	

TABLE 0-3: STATE AGRICULTURAL PRODUCTION BY COMMODITY

SOUTH CAROLINA
1990

Crop	Production	Acreage	% of Total	Average Yield/Acre
Cotton	59,500,000 lbs.	116,000	2.7	512.9 lbs.
Corn	17,300,000 bu.	244,000	5.7	70.9 bu.
Wheat	2,200,000 bu.	52,000	1.2	42.3 bu.
Oats	1,500,000 bu.	28,000	0.7	53.6 bu.
Roughage	4,038,000 tons	1,835,000	42.7	2.2 tons
Sorghum	100,000 bu.	2,000	0.1	47.0 bu.
Soybeans	51,767,000 bu.	1,785,000	41.6	29.0 bu.
Tobacco	157,700,000 lbs.	61,000	1.4	2,585.0 lbs.
Peanuts	45,400,000 lbs.	17,000	0.4	2,670.0 lbs.
Peaches	10,219,000 bu.	26,000	0.6	393.0 bu.
Tomatoes	34,000 tons	6,000	0.1	5.3 tons
Crop Failure		97,000	2.3	
STATE TOTAL		4,295,000	100.0	

TABLE 0-4: STATE AGRICULTURAL PRODUCTION BY COMMODITY

SOUTH CAROLINA
2020

Crop	Production	Acreage	% of Total	Average Yield/Acre
Cotton	22,080,000 lbs.	37,400	0.4	590.4 lbs.
Corn	29,200,000 bu.	317,400	6.7	92.0 bu.
Wheat	1,500,000 bu.	28,300	0.6	53.0 bu.
Oats	390,000 bu.	6,000	0.1	65.0 bu.
Barley	1,940,000 bu.	29,400	0.6	66.0 bu.
Roughage	5,729,000 tons	1,975,500	41.9	2.9 tons
Sorghum	40,000 bu.	700	0.1	57.1 bu.
Soybeans	76,400,000 bu.	2,124,000	45.0	36.0 bu.
Tobacco	193,900,000 lbs.	62,500	1.3	3,102.4 lbs.
Peanuts	69,700,000 lbs.	19,400	0.4	3,592.8 lbs.
Peaches	11,025,000 bu.	29,300	0.6	376.3 bu.
Tomatoes	24,000 tons	3,900	0.1	6.2 tons
Crop Failure		84,700	1.8	
STATE TOTAL		4,718,500	100.0	

TABLE 0-5: EXPECTED STATE LAND USE PROJECTIONS

	1990	2020
	-------(Thousand Acres)-------	
Harvested Cropland 1/	2,572.9	2,799.0
Hay and Pasture	1,835.0	1,975.5
Crop Failure	97.0	84.7
Planted Crop and Pasture Land	4,504.9	4,859.2
Idle Crop and Pasture Land	605.5	201.3
Commercial Forest in Production	4,762.4	8,013.6
Commercial Forest (Productive Reserve)	6,162.4	3,338.6
Pasture Converted to Forest	171.9	619.4
Forest Converted to Cropland	539.0	881.4

1/ Includes acreage for minor crops.